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This study is organized around the goal of maximization of cigarette excise tax revenues, but also considers multiple other policy goals: employment generation, promotion of small enterprise, promotion of public health, and avoidance of regressivity in the tax system. Current effective percentage rates of taxation of cigarettes are below the levels that would maximize revenues, even under very conservative assumptions, particularly in the case of *kretek* cigarettes (SKT), which are subject to lower tax rates primarily because of employment concerns. The current effective tax rate on producers of SKT is about 21.8 percent, and for cigarette producers overall it is 36.6 percent. Based on own-price elasticities of demand consistent with market data over 1999-2002, the predicted increases in real cigarette excise tax revenues range from 73.5 to 91.1 percent, the lowest effective tax rate for SKT that would maximize revenues is 51.9 percent, and the overall excise tax rate is about 55 percent. If revenue maximization were pursued, the worst-case scenario for employment would be a loss of 89,756 jobs, mostly in the SKT sector. However, analysis of National Socioeconomic Survey household data shows that cigarette taxation in Indonesia is minimally regressive, unlike most other commodity taxes.

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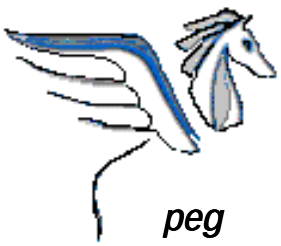
Technical Report

Cigarette Excise Taxation in Indonesia: An Economic Analysis

By Stephen V. Marks



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Abstract

This study is organized around the goal of maximization of cigarette excise tax revenues, but also considers multiple other policy goals: employment generation, promotion of small enterprise, promotion of public health, and avoidance of regressivity in the tax system.

I estimate that the current effective percentage rates of taxation of cigarettes are below the levels that would maximize revenues, even under very conservative assumptions, particularly in the case of hand-rolled *kretek* cigarettes (SKT), which are subject to lower tax rates primarily because of employment concerns. The current effective tax rate on producers of SKT is about 21.8 percent, and for cigarette producers overall it is 36.6 percent.

In the revenue maximization exercises, a variety of scenarios are considered. Based on own-price elasticities of demand consistent with market data over 1999-2002, the predicted increases in real cigarette excise tax revenues range from 73.5 to 91.1 percent, the lowest effective tax rate for SKT that would maximize revenues is 51.9 percent, and the overall excise tax rate is about 55 percent. Based on own-price elasticities of demand calculated over 2001-2002, the predicted increases in revenues range from 40.3 to 47.5 percent, and the lowest effective tax rate for SKT is 37.7 percent, and the overall tax rate is about 45 percent. Prior econometric studies of cigarette demand in Indonesia and other countries imply that greater weight should be put on the first of these sets of numbers.

If revenue maximization were pursued, the worst-case scenario for employment would be a loss of 89,756 jobs, mostly in the SKT sector. However, analysis of National Socioeconomic Survey household data shows that cigarette taxation in Indonesia is minimally regressive, unlike most other commodity taxes.

Transparency, efficiency, and revenue-yield problems related to the multiplicity of effective tax rates are also considered. Preferential tax rates for small firms and for hand-rolled cigarettes, and the setting of brand-specific effective tax rates, all create weaknesses in the tax structure that invite tax avoidance and corruption. Simpler alternative excise tax schemes are examined.

1. Introduction

The cigarette market in Indonesia includes both the traditional *kretek* cigarettes made from clove flowers and tobacco as well as cigarettes of tobacco only, most of which are brands that have originated in other countries. Among *kretek* cigarettes, some are manufactured by machine (SKM, *sigaret kretek mesin*) and some by hand (SKT, *sigaret kretek tangan*). The tobacco-only cigarettes, known as white cigarettes, are manufactured by machine (SPM, *sigaret putih mesin*). In general, SPM have filters, as do almost all SKM, but almost all SKT do not.[1] Small quantities of foreign-brand cigarettes are imported, but their high costs put them out of reach of most Indonesians.[2]

A number of competing objectives and stakeholders have complicated the formulation of cigarette excise tax policy in Indonesia. Among the objectives are:

1. Tax revenue acquisition. Since the demand for cigarettes is presumed to be relatively inelastic, it would seem that higher tax rates should generate higher tax revenues. The search for additional tax revenues is important, as the government of Indonesia seeks to maintain fiscal stability and expand development expenditures.

2. Enhancement of public health. Cigarette smoking has been demonstrated to have serious adverse health consequences. The recent Framework Convention on Tobacco Control (FCTC), to which Indonesia is a signatory, states that each country should take into account its national health objectives in setting its tobacco tax and price policies.[3]

3. Employment generation. The manufacture of hand-rolled *kretek* cigarettes is heavily labor intensive and employs hundreds of thousands of workers, mostly women, and mostly in East and Central Java. This consideration has been the basis for setting lower excise rates for hand-rolled than for machine-rolled cigarettes.

4. Promotion of small enterprise. This goal has been behind the setting of lower excise rates for smaller cigarette companies in Indonesia, but differences in rates of taxation raise serious efficiency and transparency concerns.

5. Avoidance of regressivity in the tax system. Excise taxes tend to be regressive, given that consumption tends to be highest relative to income among the poor. This presumably applies particularly to consumption of items for which demand is relatively inelastic with respect to price, such as cigarettes.

Some of these objectives dictate raising excise taxes on cigarettes, while others dictate lowering these taxes. Setting priorities among these competing objectives is the responsibility of the Government of Indonesia. This analysis will seek to assist in providing

[1] Data on medium and large industries in Indonesia in 2000 from the Central Statistics Agency indicate that 100.0 percent of SPM, 95.1 percent of SKM, and only 9.0 percent of SKT have filters.

[2] Some of these imported cigarettes are mostly for foreign residents or travelers in Indonesia who prefer brands from their country of origin.

[3] The 192 member countries of the World Health Organization of the United Nations became signatories to the FCTC at the World Health Assembly in Geneva, Switzerland, in May 2003. The convention requires legislative approval to become binding in any country. For further details, see Sari P. Setiogi, "Government to Limit Tobacco Ads and Sponsorship," *Jakarta Post*, May 24, 2003.

for more informed decision-making. The focus is primarily on tax revenues, and in particular their maximization, but the various related issues will be considered as well.

A focus on revenue maximization provides a broader and more complete view than would the more limited approach of looking at the impact on revenues of a given percentage increase in tax rates, say. It also provides a reference point for discussions of tax policy. For example, for a given revenue target, those who are most concerned about the health costs of smoking could argue that it would be better to have excise rates higher than those that would maximize revenues, while those who are most concerned about the employment effects of higher tax rates could argue that excise rates should be lower than those that would maximize revenues.

Competition among the various objectives for cigarette excise taxation has led to the emergence of a complex system with a multiplicity of tax rates. It can be argued that additional fundamental objectives of cigarette excise taxation should be the promotion of economic efficiency, good government, and the rule of law, and that these objectives are not well served by the present scheme. For example, the multiplicity of tax rates invites tax avoidance through a number of strategies that are currently legal but flaunt the principles of good governance. It also invites illegal tax evasion and associated corruption within the bureaucracy. This paper also examines these issues, and presents two simpler, cleaner alternative excise tax systems.

2. Developments in Tax Revenues

Table 1 shows that tobacco excise revenues in Indonesia have grown steadily since 1990, not only in nominal terms but also in real terms and relative to central government tax revenues and gross domestic product.[4] Real revenues more than tripled over the 12-year span, and revenues relative to GDP nearly doubled.

Two factors have been at work: the growth of the cigarette market, and since 1996 increases in excise tax rates. To confirm this assessment, one can do a decomposition of the change in excise revenues over time. Specifically, in any given year, one can view the excise revenues from cigarettes R as the product of an effective tax rate τ (tau), an overall market price P, and a total market quantity Q.

$$(1) \qquad R = \tau \times P \times Q.$$

If we take percentage changes ($\%\Delta$) of both sides of this equation, we get the approximation:

$$(2) \qquad \%\Delta R \cong \%\Delta \tau + \%\Delta P + \%\Delta Q.$$

[4] Tobacco excise revenue data are from the Excise Directorate and other sources in the Ministry of Finance. GDP and consumer price index data are from the *International Financial Statistics* of the International Monetary Fund (IMF) and from Bank Indonesia and the Central Statistics Agency. Government tax revenues are from the *Government Finance Statistics Yearbook, 2001* from the IMF, and since 2000 from the Ministry of Finance. These tax revenues have been adjusted by Bappenas so as to exclude natural resources revenues.

We can then solve for the percentage change in the effective overall rate of taxation of tobacco products as a residual:

$$(3) \qquad \%\Delta \tau \cong \%\Delta R - \%\Delta P - \%\Delta Q.$$

Table 2 presents this decomposition of the growth in real tobacco excise revenues since 1990.[5] The quantity variable is the unweighted estimated total quantities sold for the three varieties of cigarettes—SKT, SKM, and SPM—as reported by the industry associations.[6] The quantity estimates are based on the number of excise ribbons purchased by all companies in the association; an excise ribbon must be affixed to each pack of cigarettes sold within Indonesia. The price variable is a consumer price index (CPI) for cigarettes, constructed from the CPI for each of the three varieties.[7] This price index and excise revenues are each divided by the overall CPI for each year so as to be in real terms. The consumer price index did not exist for SKM prior to 1997, so the index for SKT is applied to both varieties of *kretek* cigarettes up to that point.

For fiscal years 1990 to 2002 overall, at annual rates, real tobacco excise revenues increased by 9.9 percent, quantities sold increased by 2.1 percent, and real prices increased by 3.8 percent. From these trends we infer that the effective rate of taxation of cigarettes increased at an annual rate of 4.0 percent. Note in particular the large increases in the effective rate of taxation from 1991 to 1993, 1994 to 1995, and since 2000. There has been a succession of real price increases since 1997. Quantities had been relatively constant or on the increase until 2002, when estimated quantity sold overall decreased by 10.6 percent.

3. The Cigarette Tax System

It is useful to examine in detail the relationship between the prices that suppliers receive and demanders pay under the cigarette excise system in Indonesia. For many commodity tax systems, the tax charged per unit, T, is calculated as a percentage of some supply price, P_S. For example, this could be the price that the factory receives, or that the retailer receives. For cigarettes in Indonesia, the tax per unit instead is calculated as a percentage of the price that demanders pay, P_D. However, because of poor accounting in much of the retail sector, it is not feasible for the tax to be assessed based on the actual market price. Thus, the Indonesian excise tax on a pack of cigarettes is calculated by applying a percentage rate of taxation, t, to an official retail price per pack, P_O, specified by the Excise Directorate of the Ministry of Finance.

To summarize, the relationship between supply and demand prices for a taxed commodity is

$$(4) \qquad P_S = P_D - T.$$

[5] Varieties of tobacco products other than *kretek* and white cigarettes are ignored. Totals may not add up exactly in a given row due to rounding.

[6] For *kretek* cigarettes the association is Gappri (*Gabungan Perserikatan Pabrik Rokok Indonesia*), and for white cigarettes it is Gaprindo (*Gabungan Produsen Rokok Putih Indonesia).*

[7] The price indexes are for *rokok kretek* (essentially SKT), *rokok kretek filter* (essentially SKM), and *rokok putih* (SPM).

In Indonesia, the tax per unit is calculated as

$$(5) \qquad T = t \times P_O.$$

Thus, the relationship between the supply price and the demand price is

$$(6) \qquad P_S = P_D - t \times P_O$$

If the official price, $P_{O,}$ were exactly equal to the demand price, P_D, then the tax rate t would show the fraction of the price paid by consumers that goes to the payment of taxes.

If either the tax rate t or the official price P_O is changed, then the excise tax per unit will change. As a general proposition, however, such a change will not necessarily translate into an equivalent change in the supply price, since suppliers may be able to shift part or all of the tax onto consumers.

The extent to which suppliers are able to do so will depend on both demand and supply conditions. In a perfectly competitive market, price-elasticities of demand and supply would be the critical parameters. Output in the cigarette industry in Indonesia is relatively heavily concentrated, however, as will be illustrated later, so that in principle one should take into account all other factors that influence the market power that firms are able to wield.

4. Some Details of the System

The percentage tax rate and the official retail price (HJE, *harga jual eceran*) are both specified on the excise ribbon that must be purchased by the manufacturer and affixed to each pack of cigarettes. The HJE per pack is calculated based on an HJE per cigarette, which is multiplied by the number of cigarettes in a given pack. The HJE per pack is then rounded up to the nearest amount evenly divisible by 100 rupiah.

Separate percentage rates of taxation are set for each of the three varieties of cigarettes, and for companies of different sizes, with substantial preferences for smaller companies. In addition, for each variety of cigarettes and each producer size range, a minimum HJE per cigarette is specified, with smaller companies subject to lower minimum HJE. The minimum HJE serves as a lower bound for the various brand-specific HJE. Contrary to a popular impression, the tax per unit is calculated by application of the percentage rate of taxation to the brand-specific HJE rather than to the minimum HJE for each category. Moreover, the minimum HJE does not constrain actual market prices, which may be below it in practice. Table 3 shows the percentage excise tax rates and minimum HJE applicable in 2003.[8]

Both domestic and imported cigarettes are subject to the 10 percent national value added tax.[9] Imported cigarettes of each variety are subject to the same excise tax rates and minimum HJE

[8] *Keputusan Menteri Keuangan Republik Indonesia Nomor* 449/KMK.04/2002 *Tentang Penetapan Tarif Cukai dan Harga Dasar Hasil Tembakau*, 24 October 2002.

[9] The value added tax is calculated by application of the 10 percent rate to the HJE for the brand, and is paid at the same time the excise tax is paid. (*Keputusan Menteri Keuangan Republik Indonesia Nomor* 62/KMK.03/2002 *Tentang Dasar Penghitungan, Pemungutan, Dan Penyetoran Pajak Pertambahan Nilai Atas Penyerahan Hasil Tembakau*, 26 February 2002.)

as large producers of the respective varieties. An additional duty of 15 percent is assessed on imported cigarettes, and cigarette importers must be registered with the Ministry of Finance as importers of goods subject to excise tax. In practice, only white cigarettes are imported.

Each year the percentage rates of taxation, minimum HJE, and HJE for each brand are reviewed and updated by the Excise Directorate of the Department of Finance, with ultimate approval by the Minister of Finance. Law Number 11 of 1995 on Excise Taxation specifies a maximum percentage rate of taxation for commodities subject to an HJE system at 55 percent.

4.1. Official Versus Retail Prices in Practice

Cigarette manufacturers have complained that the official retail prices are set well above typical market prices for many brands, so that the effective tax rate is considerably higher than the official percentage rate.[10] It was recently reported:

> "To make ends meet, clove cigarette manufacturers have to comply with market forces by setting retail prices at about 30 percent to 35 percent lower than the excise-related prices set by the government."[11]

If this assertion were correct, then it would imply that the nominal percentage rates of taxation should be adjusted to compensate for the bias in the official retail prices set by the government, so as to provide a more accurate picture of the effective percentage tax rate.

Table 4 shows the findings of a retail market survey conducted by the author in May 2003 that sheds light on these issues. The survey was done in central Jakarta, and covers a variety of popular brands of *kretek* and white cigarettes. The columns on the left of Table 4 show some basic data: the producer and the brand, the number of cigarettes per pack, and the excise tax rate applicable to the brand, based on the size of the producer and the type of cigarette. Next is shown the official retail price for 2003 for each brand, as set by the Excise Directorate.

The basic findings of the market survey are summarized by the average retail market price during the period of the survey. These prices are not necessarily representative of prices throughout Indonesia or even in the Jakarta area.[12] In particular, three of the included retailers were low-price, high-volume retailers subject to competitive conditions. One of these was an employee cooperative at a government ministry, one was a large grocery store that is part of a chain of stores, and one was a cigarette distributor who sells the majority of his product to smaller vendors rather than directly to consumers, but also sells to consumers at the same prices. Also included were prices from vendors in two street areas and from one traditional market.

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[10] It is intended that the official price be at or above actual retail prices. If retail prices for some brand exceed the official price, the manufacturer is to file a report with the Excise Directorate so that the official price can be adjusted.

[11] Evi Mariani, "Clove Cigarette Excise-Related Price Must be Halted: Gappri," *Jakarta Post*, May 22, 2003.

[12] A subsequent follow-up survey in highland villages and major cities of the Toraja district of South Sulawesi revealed prices of major brands that were comparable to those in Jakarta. However, in the district, many more low-cost brands from smaller companies were available, which is probably typical of lower-income areas in general.

Several low-price retailers were included in the sample in an effort to bias the findings in favor of the argument made by *kretek* manufacturers, that actual market prices are far below official retail prices. The market and official prices are compared by calculation of the average premium of the official price over each of the market prices for each brand.[13]

The simple average of these average premiums for the surveyed brands from large companies only was 12.1 percent for SKT, 17.8 percent for SKM, and 15.8 percent for SPM.[14] These figures do not come close to the figure of 30 to 35 percent of the official price cited in the *Jakarta Post*.[15]

The differences in these averages across the three types of cigarettes do imply a further distortion in relative effective rates of taxation, however, since on average SKT not only have the lowest nominal rate of taxation, but also the lowest official price premium. The final column of Table 4 shows the effective excise tax rates for the various brands, taking into account the official ad valorem rate and the average price premium for each brand.[16] For large companies only, the simple average effective tax rate across the selected brands was 24.7 percent for SKT, 47.1 percent for SKM, and 46.3 percent for SPM. Overall, the weighted average rate for large companies was about 38.7 percent, using estimated 2002 sales levels of the three types as weights.

4.2. International Comparisons

It is useful to summarize excise tax rates for cigarettes in Indonesia overall, not just for the brands in the market survey, and to put these rates in an international context.

Table 5 shows effective excise tax rates for Indonesia in 2003, for each of the three varieties and overall. These figures are based on comprehensive data across all brands from the Excise Directorate, and calculations by the author.[17] The unadjusted figures for Indonesia are based on official retail prices (HJE), while the adjusted figures make a rough adjustment for the differences between the official and the actual market prices, based on the findings of the market survey presented in Table 4.[18] The systematic differences in official price premiums across varieties of cigarettes clearly widen the nominal differences between their tax rates. The overall unadjusted rate of cigarette taxation is 31.5 percent, while the adjusted rate is 36.6 percent.

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[13] In general, this is higher than the premium of the official price over the average of the market prices. It is also the calculation we are interested in, if we wish to find how much higher the effective tax rates are after being adjusted for deviations between the official price and market prices.

[14] It would be more desirable to have brand sales weights, at least for major brands. My sales data from the Excise Directorate are at the brand level, but are only identifiable with a particular company. The brand name is not given.

[15] Only for two brands is the average premium more than 30 percent of the market price. The wording of the excerpt from the *Jakarta Post* implies that the difference is 30 to 35 percent of the official price, which is generally higher than the market price. Thus, the assertion seems even less plausible.

[16] For some brand, let π (pi) be the official price premium over the market price, measured in decimals. Then $P_O = (1 + \pi) \times P_D$, and the effective tax rate is $t \times (1 + \pi)$. Equation (6) then shows $P_S = P_D \times (1 - t \times (1 + \pi))$.

[17] The excise tax rates and HJE are from 2003, but company production levels are from 2002.

[18] This entails multiplying the unadjusted rate for SKT by 1.121, for SKM by 1.178, and for SPM by 1.158, based on the simple averages mentioned in the text. These simple averages apply only to large companies, while the figures in Table 5 are supposed to apply to small, medium, and large companies.

Table 6 puts Indonesia in a comparative context in Southeast Asia. The countries are arranged in order of excise tax rate, from highest to lowest. The first column shows the overall excise tax rate, as a percentage of the consumer price, for various years between 1993 and 1996. Based on these figures, which for Indonesia are roughly comparable to those shown in Table 5, Indonesia is toward the bottom in terms of cigarette excise tax rate. The second column shows the consumer cost for a pack of cigarettes, in this case the American brand Marlboro.[19] By this standard, Indonesia is a relatively high-cost cigarette market.

5. Maximization of Excise Revenues

The main question of this paper is how to maximize cigarette excise tax revenues in Indonesia. The present section, which is divided into several parts, will seek the answer. Section 5.1 considers the fundamental parameters and issues related to market demand. Section 5.2 then describes in detail the basic methodology and assumptions used in the analysis. Section 5.3 presents the findings, and Section 5.4 considers some important qualifications.

Like all the analytical frameworks presented in this paper, this analysis is not meant to be exhaustive, but rather to provide a basis for further inquiry by the government of Indonesia. In particular, there are considerable uncertainties about the market parameters to be applied in an analysis of this sort. Section 5.3 will include sensitivity analysis, in which assumptions about the parameters are varied, to determine their influence on the conclusions. However, additional efforts along these lines could be undertaken, as additional information is acquired or based on alternative beliefs about how the market should be parameterized.

5.1. Demand Side Specification

My basic approach is to assume that the real supply price and tastes are constant.[20] Thus, changes in quantity sold are due only to changes in quantity demanded. If tastes are unchanged, then changes in quantity demanded should be due to changes in population, incomes, prices of related goods, and the price of the product itself.

A critical parameter in the prediction of the effects of changes in excise tax rates is the price elasticity of demand. Appendix 1 examines in very simple terms the relationship between the price elasticity of demand, consumer expenditure, and tax revenues.

I will use price elasticities of demand for hand-rolled *kretek* cigarettes (SKT), machine-rolled *kretek* cigarettes (SKM), and white cigarettes (SPM) that are consistent with experience over the years since the economic crisis of 1997-98 and with basic economic theory, and that are informed by prior empirical studies of Indonesia. The next section will show the income elasticity of demand to be a potentially important parameter in this analysis as well.

[19] The source for the first column is World Bank (2003), and for the second column is Guindon, et. al (2002), who took the data from the Economist Intelligence Unit.

[20] The supply price is the minimum price that suppliers of a product are willing to take to supply a given quantity of a product. If it is constant, then the supply curve for that product is a horizontal line. It is probably not unreasonable for the cigarette industry over the long run that total production can be expanded or reduced without significantly influencing costs per unit. However, the assumption that there is a supply curve in turn requires perfect competition, which is problematic given the extent of industrial concentration in the three sectors. See Bird (1999) for further analysis.

Chaloupka and Warner (1999) survey the econometric literature on cigarette demand, and note that most recent studies put the price elasticity of demand for cigarettes overall between -0.14 and -1.23, but more typically between -0.3 and -0.5. However, the studies surveyed were primarily for industrial countries. Because conditions can vary substantially across countries, particularly with respect to the income elasticity of demand, it is most useful to focus on the prior literature for Indonesia.

Bird (1999) used annual aggregate data for Indonesia over 1970-94 to estimate a price elasticity of demand for cigarettes of –0.43 in the long run and an income elasticity of demand of 0.83 in the long run.[21]

Djutaharta, et al. (2002) also used aggregate time series data for Indonesia. Annual data from 1970-96 yielded a price elasticity of –0.57 and an income elasticity of 0.46, while annual data from 1970-2001 yielded a price elasticity of –0.35 and an income elasticity of 0.47.[22]

Finally, based on the 1999 Indonesia National Socioeconomic Survey (Susenas), Adioetomo et al. (2001) estimated a total price elasticity of cigarette demand of –0.61 and found that the price elasticity decreased in absolute value at higher income levels: lower-income households had more price-elastic demand for cigarettes.[23] This variation in the price elasticity of demand is consistent with models of rational addiction, which imply that price elasticities of demand are higher among less educated smokers. It is also consistent with empirical findings in other countries.[24] The total income elasticity was 0.76, and was a decreasing function of income.

One reason to focus on changes within the last few years, and thus to put relatively less weight on earlier studies within Indonesia, is that there have been significant shocks to the market since the economic crisis of 1997-98. In particular, there were dramatic reductions in the current and anticipated future real incomes of Indonesian households. If demand becomes more price elastic at lower income levels, then we could expect demand to have become more price elastic in the aftermath of the economic crisis.

An even more important reason to focus on changes in the last few years is that there have been significant increases in real prices of cigarettes since 1996. Figure 1 shows that real prices for all varieties of cigarettes have increased substantially, particularly those for SPM,

[21] The study used an error-correction model to account for the non-stationarity of price, quantity and income data. It estimated a short-run price elasticity of –0.60, and a short-run income elasticity of 0.70. It may be problematic that the long-run price elasticity estimate is smaller than the short-run estimate. Also included in the estimation were a dummy variable to indicate the end of the ban on television advertising in 1989 and policy changes in 1991, as well as a dummy variable to reflect mechanization of production by Gudang Garam and Djarum in 1980-81.

[22] Also included were dummy variables to account for the introduction of the health warning on cigarette packs in 1991 and for the economic crisis of 1997.

[23] The total price elasticity includes both the decision on whether to smoke, and if so how much to smoke. The study found that the elasticity for the amount of smoking, conditional on being a smoker, was –0.60, but found the smoking participation elasticity to be small and statistically insignificant.

[24] However, there is the question of how to interpret price variations in cross section data, given that regional variations in prices are negligible. Section 7.1 will present evidence that prices vary by income bracket, and that price variations across consumers are an inherent reflection of decisions made by consumers.

which have nearly doubled since 1996.[25] The real prices for SKT have increased the least, but even so almost by 50 percent. Between 1990 and 1997, real prices for all three varieties were much more constant. A sharp increase in real *kretek* prices in 1991 had been fully eroded by 1995.

The recent real price increases are particularly important in that increases in prices, all else equal, will cause demand to become more price-elastic if demand is linear. In particular, for a straight-line demand function, the price elasticity of demand varies from zero at the point at which price is zero to negative infinity at the price at which quantity demand is equal to zero.

A common alternative specification in empirical studies is a constant-elasticity framework, which by definition does not allow elasticities to change even if there are significant changes in market conditions.[26] As will be shown later, there is some evidence that the quantity responses to price increases of recent years are greater than observed in the past, consistent with the arguments presented so far. There thus may be a good reason to assume linear rather than constant-elasticity demand.

There is also a good methodological reason to make this assumption: linear demand will yield more conservative conclusions, in the sense that tax revenues will be maximized at lower excise tax rates than would be the case with constant-elasticity demand, all else equal. Linear demand will also imply lower estimates of the revenues to be gained through higher rates of taxation. These points are developed further in Appendix 2.

5.2. Other Methodology and Assumptions

Consider the market for all cigarette products taken together. Quantity demanded, Q, can be viewed as the product of population, N, and quantity demanded per capita, $q \equiv Q/N$:

$$(7) \qquad Q \equiv N \times q \, .$$

If we take percentage changes on either side of equation (1), we then get the approximation,

$$(8) \qquad \%\Delta Q \cong \%\Delta N + \%\Delta q \, .$$

The percentage change in quantity demanded per capita in turn can be decomposed into a change due to the change in real income per capita (I) and a change due to the change in the real price of cigarettes (P):

[25] These real prices are given by the consumer price indexes (CPI) for white cigarettes, kretek filter cigarettes, and kretek cigarettes, relative to the overall CPI for Indonesia. Based on the data in footnote 1, these can be assumed to correspond to SPM, SKM, and SKT, respectively.

[26] Most of the prior estimates of cigarette demand have imposed the constant-elasticity functional form, perhaps for analytical convenience more than any expectation that the form is more realistic than the linear one. However, Grossman (1993) is an example of a study that uses a linear demand function.

$$(9) \qquad \%\Delta q \cong e_I \times \%\Delta I + e_P \times \%\Delta P.$$

The e_I and e_P terms in equation (9) represent the income elasticity and the price elasticity of demand per capita, respectively.

If we substitute equation (9) into equation (8), we can solve for the price elasticity of demand for cigarettes implied by recent price-quantity data, given the rate of population growth, the rate of growth of income per capita, and an assumption about the income elasticity of demand.

Table 7 shows three alternative scenarios, based on the income elasticity of demand being equal to 0.4, 0.6, and 0.8. Income elasticities of demand for cigarettes in other countries typically are estimated to be positive but less than one. These particular figures are within the range of recent estimates for Indonesia, and the middle figure is consistent with my own rough estimate of the income elasticity of demand in Section 7.2 below, based on household data from the 2002 National Socioeconomic Survey.

The percentage changes in Table 7 are all shown as the change between the given year and 2002, but as percentages of the 2002 values rather than the earlier value, so that point elasticities relative to the 2002 levels can be calculated directly.

Two important inferences can be drawn from Table 7. First, overall demand for cigarettes in Indonesia evidently has become more price elastic in recent years, but the estimated price elasticity of demand is very sensitive to the choice of years used to do the calculation. An argument that can be made in favor of using an earlier year, and thus using a lower price elasticity of demand, is that there could be cumulative effects of prior price increases. Thus, if we look only at the changes from 2001 to 2002, we see a relatively small price change and a much larger quantity change, but the quantity change could be in part a function of price changes in earlier years. Moreover, price elasticities greater than one in absolute value are unusual in the prior literature on overall cigarette demand in Indonesia and other countries. For both of these reasons, the smaller elasticity estimates seem more plausible than the larger elasticity estimates in Table 7. In any case, sensitivity analysis can be used to determine how much influence the price elasticities of demand have on the policy analysis that follows.

Second, Table 7 shows that the greater is the income elasticity of demand, the greater is the price elasticity of demand in absolute value, though this effect is not particularly strong. Thus, the assumption made about the income elasticity of demand will influence the conclusions reached, though perhaps not too strongly.

A similar methodology to infer the price elasticity of demand that is consistent with recent data can be applied for the three individual varieties of cigarettes. There is one additional complication. It is reasonable to suppose that there could be substitution among the three different kinds of products, based on their relative prices. Such effects can be captured by the cross-price elasticity of demand. If the real price of SKM is constant, for example, but the real price of SPM goes up, we could expect the quantity of SPM demanded to go down, but also for the quantity of SKM demanded to go up. If the cross-price elasticity of demand for SKM with respect to the price of SPM is zero, then no such effect will occur.

Certainly, cigarette producers in Indonesia believe that such price effects exist. For example, *kretek* producers expressed outrage at a policy change by the Ministry of Finance early in 2003 that slightly lowered official retail prices for white cigarettes. The producers were presumably outraged because this policy change could draw demand away from *kretek* cigarettes.[27]

I will suppose that cross price effects can occur among the three cigarette products. Specifically, for a given span of years, such as 1999 to 2002, the approach will be as follows:

1. Assumptions about the income elasticities of demand for each of the three varieties, plus data on growth in real income per capita and population, will be used to adjust the percentage change in quantities purchased for each of the three varieties. The residual percentage change in quantities will presumably be due to the effects of real price changes on demand, under the assumption that the real supply price and tastes are constant.

2. For each type of cigarette, the sum of the cross-price elasticities of demand with respect to the prices of each of the other two types of cigarettes will be arbitrarily assumed to equal some constant. For example, it could be assumed that the sum of the two cross price elasticities is equal to 0.4 for each type of cigarettes, or it could be assumed that the sum of cross-price elasticities is smaller for white cigarettes than it is for either type of *kretek* cigarettes.

3. It will then be assumed that the aggregate demand for cigarettes meets the conditions on demand implied by individual utility maximization. One of these conditions implies a restriction on the cross-price elasticities of demand, which this paper will utilize. Appendix 3 discusses this restriction in some detail.

4. This restriction can be used to solve for the individual cross-price elasticities of demand (which sum to the arbitrarily assigned constant) and the own-price elasticity of demand that are consistent with the data of recent years.

5. If the cross-price elasticities are assumed to sum to zero, then this determinant of demand becomes irrelevant and the own-price elasticities of demand that are consistent with the data can be solved directly from the first step.[28]

This framework is attractive in that it allows the data to play a role, albeit not a complete role, in derivation of both the own-price and cross-price elasticities of demand. It is also informed by economic theory, and by the findings of prior empirical studies.

Table 8 shows an example of a parameterization used for the own-price elasticity calculations. The income elasticities are assumed to equal 0.6 for each type of cigarette. The two rival product types for each type of cigarette are indicated. The sum of the cross-price elasticities of demand for each variety of cigarettes is assumed to be 0.40. The cross-price elasticities are then the solutions to the cross-price elasticity restrictions mentioned earlier.

[27] An alternative interpretation is that the *kretek* producers were simply angling for a price cut of their own. For coverage of the complaints, see Bambang Sutedjo "Tarif Cukai, Privilege Buat MNC?" *Bisnis Indonesia*, 13 Januari 2003.

[28] Zero values of all the ordinary cross price elasticities of demand are actually inconsistent with the restriction dictated by utility maximization.

(It is only coincidental that the cross-price elasticities for SKT and SPM look similar; in fact these numbers are not exactly equal.) In order to determine how sensitive the maximization of revenues is to the assumptions made about income elasticities and sums of cross-price elasticities, sensitivity analysis will be performed in Section 5.3.

Table 9 presents the calculations of implied own-price elasticities of demand for the three cigarette product types, based on the parameterization in Table 8. Because Table 7 shows considerable variation in the implied elasticity of demand for cigarettes overall based on the span of years used, Table 9 examines two scenarios. The first set of columns look at changes in the market between 1999 and 2002, while the second set of columns look at changes from 2001 to 2002. We should expect that demand for the three cigarette types will appear to be more price-elastic based on the second of these two periods, just like demand for cigarettes overall. The population growth and income-per-capita growth figures used in the calculations are the figures for the relevant years (1999-2002 and 2001-2002) shown in Table 7.

As expected, Table 9 shows the own-price elasticities for particular cigarette types to be higher in absolute value than the price elasticity of demand for cigarettes overall, shown in Table 7. Table 9 also shows considerable variation in the own-price elasticities between the two time periods. For reasons mentioned in the context of the market for cigarettes overall, the elasticity calculations based on 1999-2002 arguably are more plausible than those over 2001-2002.

To calculate the excise tax rates that would maximize tax revenues, two issues remain to be addressed. The first is that there is not a single tax rate for each product category. The empirical analysis that follows applies only one excise tax rate—the ad valorem rate that applies for large producers—for each of the three varieties of cigarettes in 2002, which is the benchmark year for the analysis. The choice of the initial excise tax rate matters because this rate will determine the real supply price for each type of cigarettes, given the real market price. As noted earlier, this supply price is then assumed to remain constant even if excise tax rates are changed substantially.

Using the tax rate for large producers arguably makes more sense than using an average for all producers of a given product type, since the supply price presumably represents the *lowest* price that would induce producers to supply a given quantity to the market. Thus, applying the highest tax rates, which as we will see later apply to the vast majority of output for each type of cigarettes anyway, sets the supply price at the lowest level that evidently is profitable for suppliers.[29]

There is then the question of how to interpret and apply the conclusions of this section, given the multiplicity of tax rates, and particularly the differences in rates based on the size of the company. Two approaches could be contemplated:

- The approach that makes sense economically is that all producers of a given type of cigarettes should be subject to a single effective tax rate, such as the one that would maximize tax revenues. In other words, effective tax rates on small and medium firms should be leveled up to the new rates specified for large producers.

[29] As it turns out, Section 9.2 will show that supply prices actually are lower for small companies than large companies. Further discussion is provided in that section.

- A more conservative approach would be for the multiplicity of rates to be retained, but for all rates to be reset in proportion to their current levels, based on the new rates specified for large producers. For example, if excise rates for large SKT producers should be doubled, from 22 to 44 percent, then the excise tax rates for the smallest SKT producers should also be doubled, from 4 to 8 percent.

In terms of overall impact, the difference between the two approaches is not too large. Table 5 showed that the 2003 weighted-average nominal percentage excise tax rate across all producers of SKT was 19.4 percent, versus 22 percent for large producers.[30] For both SKM and SPM, it was 38.6 versus 40 percent. Although there are substantial differences in excise tax rates applied to producers of different sizes, as shown in Table 3, overall the market is dominated by large producers, as will be discussed further in Section 9.2.

An additional issue is whether other tax revenues should be taken into account in this analysis, since decreases in the quantity of cigarettes sold will affect not only excise revenues but also value added tax revenues and personal and corporate income tax revenues. I will take the view that these other taxes need not be considered—that there could be some negative short-run effects on revenues from other taxes, but that any long-run effects will be small and difficult to predict:

- The tax base for the value added tax, which is essentially total consumer expenditure in the economy, arguably will not be reduced by taxation of a particular commodity, at least not in the long run. Changes in consumer expenditure on cigarettes typically will translate into offsetting changes in consumer expenditure on other products.

- Income taxes on earnings of workers in the cigarette sectors will be reduced, due to reductions in employment. Some of these workers will find new jobs in the modern sector, and thus continue to be subject to income taxes. Although some workers could permanently move into the informal sector as a consequence of increased taxation of cigarettes, and thus be beyond the reach of income taxation, the impact on income tax revenues will be small.[31]

- Corporate profits and thus corporate profits taxes will also be reduced. The premise of the assumption of a constant supply price is that entry into or exit from the industry in the long run will allow the size of the industry to adjust to changes in quantity demanded due to changes in excise tax rates, but that economic profits will remain at zero. In reality, the cigarette sectors are not perfectly competitive. Companies thus earn some economic profits that could be taxed away at a maximum rate of 30 percent, but to predict how these amounts would change is very difficult.[32]

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[30] These are nominal percentage rates, unadjusted for any deviations between official retail prices and actual market prices.

[31] Section 9.2 will show that the vast majority of production workers in the cigarette sectors earn wages well below the average in manufacturing industries. Thus, most of their wage income is excluded from taxation because of their personal exemptions (PTKP, *penghasilan tidak kena pajak*). In particular, the economic stimulus package enacted earlier this year presumably exempts workers from income taxes on their wages up to the local minimum wage level. Most production workers in the hand-rolled *kretek* cigarette industry are piece-rate workers, with wages around or below minimum wage levels. Given their low incomes, any of their income subject to taxation would be taxed at only the five percent rate.

[32] The difficulties are due both to the complexity of the cigarette market and to the lack of data. However, it is noteworthy that the combined operating profits of the two largest cigarette producers in Indonesia (Gudang

Given that revenues from other taxes could be reduced by increases in cigarette excise tax rates, particularly in the short run, a cautious interpretation of the findings of the empirical analysis that follows would be that the projected increases in revenues are upper bounds on the overall increases in revenues that should be expected.

5.3. Empirical Policy Analysis

This section calculates effective excise tax rates that maximize excise revenues under various scenarios—various combinations of assumptions about market conditions. It is assumed that separate percentage rates of taxation will be set for the three varieties of cigarettes. Section 9.3 examines the same scenarios, but in the context of two simpler alternative tax systems.

As discussed in Section 5.1, it will be assumed that demand is linear. Thus, I translate from the price elasticity units shown in Table 9 into slope units instead.[33]

Table 10 shows the benchmark data used in the excise tax revenue maximization exercises. The quantities are the numbers of cigarettes purchased in 2002 and the initial prices are the 2002 values of the real prices shown in Figure 1. The official excise tax rates are the effective excise tax rates for large producers of each type of cigarette. These effective excise tax rates apply the official percentage tax rates to the simple average of the ratio of the average official retail price to the market retail price for large producers in 2002,[34] based on the market survey presented in Table 4.

These benchmark figures were used in the calculations: for example, to set the position of the straight-line demand function for each type of cigarette. In addition, the percentage changes that will be shown in Table 11 can be applied to these benchmarks, to find the quantity, real price, consumer expenditure, or excise tax revenues that are implied by the new tax rates.

Table 11 shows the effective excise tax rates that maximize cigarette excise revenues based on the own-price elasticities calculated for the two spans of time—1999-2002 in the boxes on the left and 2001-2002 in those on the right—for a variety of parameterizations like those shown in Table 8. The overall effective excise tax rate is calculated from the three product-type tax rates, using the new expenditure shares for the three types as weights.

Garam and Sampoerna), which are the only such companies that are publicly listed in the country, increased in nominal but not real terms from 2000 to 2001, and from 2001 to 2002, despite the evident substantial increases in excise taxation shown in Table 2.

[33] The price elasticity of demand at some point along a demand curve is given by $(\Delta Q/\Delta P)/(Q/P)$, where Q is the initial quantity and P is the initial price, and $\Delta Q/\Delta P$ shows the change in quantity demanded relative to a change in price along the demand curve at that point. The slope term mentioned will simply be $\Delta Q/\Delta P$, which is easy to infer from the elasticity using the initial values of Q and P.

[34] Market survey data for 2002 were not available. Thus, these ratios are calculated by working backwards from the average official price premiums for large firms May 2003 implied by the numbers in Table 4 (12.1 percent for SKT, 17.8 for SKM, and 15.8 percent for SPM). Specifically, the ratio of the consumer price index (CPI) for each type of cigarettes in May 2003 relative to its annual CPI for 2002 is used to adjust market prices, and the ratio of the weighted average official retail prices for large brands in 2003 versus 2002 is used to adjust the official prices. (Official prices for large brands went up by 20.7 percent for SKT, 18.4 percent for SKM, and 23.3 percent for SPM. CPI prices went up by 8.7 percent for SKT, 8.3 percent for SKM, and 8.7 percent for SPM. By the way, these figures indicate that the supply price was not constant between 2002 and May 2003: official prices were going up faster than market prices, while percentage tax rates were constant or increasing. See Section 5.4 for further discussion.)

The general conclusion of the empirical analysis is that excise tax rates on cigarettes in Indonesia are below the rates that would maximize tax revenues, especially in the case of hand-rolled *kretek* cigarettes, despite the relatively high price elasticities of demand used in this analysis. In addition, this conclusion is not particularly sensitive to the assumptions about income-elasticities or cross-price elasticities. It is, however, sensitive to the time period used to calculate the own-price elasticity of demand. For the 2001-02 period, the measured own-price elasticities of demand for SKT and SKM are generally higher than their counterparts based on the 1999-2002 period, but the opposite holds for SPM.

It is useful to describe the scenarios in Table 11 in some more detail:

- Scenarios 1, 2 and 4 use the expenditure (income) elasticities of demand for individual product types that will be shown in Table 18 and that are based on cross-section data. As will be discussed later, these elasticities are derived from a quality-adjusted measure of quantity, in which quality is reflected in the average price of cigarettes purchased by a given household. The most traditional product, SKT, which typically is not filtered, has the lowest income elasticity, while the foreign-origin product, SPM, has the highest. SKM is in between, and the overall income elasticity of demand for cigarettes is 0.63.

- Scenario 3 uses alternative income elasticities of demand for individual product types that will also be shown in Table 18. These are calculated based strictly on the quantities consumed, with no adjustment for quality. The ranking of these elasticities by size is similar to the quality-adjusted ones; the overall income elasticity of demand for cigarettes is 0.46.

- Scenario 5 uses an income elasticity of demand set for each type of cigarettes at 0.60, which is within the range of recent estimates of the overall income elasticity of demand for cigarettes in Indonesia.

- Scenarios 1, 3, and 5 arbitrarily assume that the cross-price elasticities of demand for each type of cigarettes sum to 0.40. For each type of cigarette, the cross-price elasticities calculated for each of the two rival product prices, based on the theoretical restriction discussed in Appendix 3, are of roughly similar sizes.

- Scenario 2 assumes that the two cross-price elasticities for SKT sum to 0.4, and similarly for SKM, but that the cross-price elasticities for SPM sum only to 0.2. In this case, the implied cross-price elasticities for the individual product types are more skewed. The cross-price elasticities of demand for SKT and SKM versus each other are much higher than their cross-price elasticities versus SPM. The cross-price elasticity calculated for SPM with respect to the price of SKM is almost double that for SPM with respect to the price of SKT.

- Scenario 4 assumes that these cross-price elasticities of demand for cigarettes are all zero.

Based on the own-price elasticities of demand calculated from 1999-2002, the predicted increases in real cigarette excise tax revenues range from 73.5 to 91.1 percent, the lowest effective tax rate for SKT that would maximize revenues is 51.9 percent, and the overall tax rate is about 55 percent. Based on the own-price elasticities of demand from 2001-2002, the

predicted increases in revenues range from 40.3 to 47.5 percent, the lowest effective tax rate for SKT is 37.7 percent, and the overall tax rate is about 45 percent.

As an aside, in its own revenue forecasts in October 2002, the Excise Directorate used elasticities of demand for SKT of -0.52, SKM of -1.12, and SPM of -0.14. If these elasticities are used in the linear-demand framework (with cross-price elasticities equal to zero), the excise tax rates that maximize revenues are 57.1 percent for SKT, 53.8 percent for SKM, and 86.5 percent for SPM, far higher than current rates, and the predicted increase in revenues is 151.2 percent relative to the 2002 level.

Later sections of this paper will make additional use of the data presented in Table 11, and Section 9 will replicate the scenarios presented in Table 11 using simpler excise tax systems.

5.4. Qualifications

The conclusions reached about revenue maximization in the previous section are subject to a number of qualifications.

First, long-run price elasticities over several decades could be considerably higher than short-run elasticities, if tax increases are maintained in real terms, due to the deterrent effect of higher prices on youth smokers (Grossman, et. al, 1993). In addition, along with stricter regulation of the cigarette sector and consumer education efforts, heavier taxation of cigarette consumption could contribute to an evolution of norms within Indonesian society away from tolerance of smoking. For both of these reasons, long-run real revenue potential may not be as great as appears at the moment.

Second, there currently are concerns that there has been a big drop in the quantity of cigarettes demanded recently that may necessitate the downward revision of the 2003 excise revenue target.[35] It will be important to understand clearly the causes of the decrease in excise revenues, particularly since the available cigarette sales data from the industry associations are derived from excise ribbon sales by the government, so that there is no independent way to determine whether the presumed decrease in demand is real or is due to tax evasion. This is particularly a concern because the sharp drop in measured demand in the recent past appears to be inconsistent with the bulk of econometric evidence from Indonesia and other countries, which tend to find demand to be relatively inelastic.

To put the dilemma in sharper focus, it could be that demand genuinely has been soft, and that efforts to increase excise taxes to increase revenues should proceed with caution. On the other hand, it could also be that the weaknesses in the structure of cigarette excise taxes and in enforcement are being more and more exploited by producers and others, in order to legally avoid or illegally evade paying excise taxes, as effective excise tax rates have been raised:

- For example, there could be further shifting by consumers to hand-rolled *kretek* cigarettes, due to their lower tax rates and thus lower prices. There could also be shifting by consumers to small companies that are not members of the industry

[35] See, for example, Rendi A. Witular, "Government Likely to Revise Downward 2003 Excise Revenue Target," *Jakarta Post, June 9, 2003.*

associations, and thus whose purchases of excise ribbons would not be reflected in the market data from the associations.

- There could be the assigning of allegedly new cigarette brands by large firms to affiliated small firms, in order to avoid high tax rates, which is perfectly legal under the current system.

- There could also be increased black market activities and related bureaucratic corruption. Although excise taxation of cigarettes has been viewed as a relatively clean and straightforward way to raise revenues, there is already some evidence that transactions using counterfeit excise ribbons or no ribbons have occurred.[36]

Within a given institutional environment, particularly one in which the rule of law is weak, tax policy enforcement will be more difficult, the higher are tax rates.[37] In this sense, an attractive feature of the analysis presented in this paper is that I derive price elasticities of demand from the data that matter most for tax revenues—the actual purchases of excise ribbons. Nevertheless, how ironic it would be if weaknesses in the tax system rather than genuine weaknesses in demand were causing the further decline in revenues—in particular due to legal tax avoidance and illegal tax evasion—but that the government gave in to demands by the cigarette industry for lower tax rates because demand appeared to be soft!

If excise tax rates are to be increased substantially in Indonesia, the enforcement effort will need to be more focused on detection and deterrence of illegal activities, and the tax structure will need to be simplified, which will make tax avoidance and evasion more difficult. Simplification of the structure will be discussed further in Section 9.

Finally, the assumption that the supply price is constant is not very realistic, at least not in the short run. Since last year, for example, cigarette retail market prices have increased by less than the official retail prices used to calculate excise tax obligations (see footnote 34). Thus, in effect, suppliers have cut into their profit margins in order to hold down prices to consumers. If such tendencies were to continue, then the effects of higher excise tax rates on equilibrium quantities and prices would generally not be as large as indicated in Table 11. Development of more sophisticated models of pricing in this oligopolistic industry would be useful.

6. The Economic Importance of the Cigarette Industry

Opponents of increases in cigarette excise taxes argue that the cigarette industry is very important to Indonesia, and will be seriously damaged by higher taxes. Some claim that employment related to cigarette production runs in the millions.

[36] See for example, "Rokok Tanpa Pita Cukai Juga Banyak Beredar," *Kompas*, 17 Mei 2002, and especially Robert Go, "Cigarette Makers Among Jakarta's Biggest Tax Cheats," *The Straits Times* (Singapore), May 24, 2003. The latter reports on an investigation conducted in 2003 by the Ministry of Finance in conjunction with Diponegoro University.

[37] High excise tax rates do not necessarily lead to illegal activity. In Singapore, the overall excise tax rate on cigarettes is 73 percent of the consumer price, as shown in Table 6, but there is negligible if any illegal activity in the cigarette sector. Needless to say, governmental and legal institutions are not as strong in Indonesia as in Singapore.

Basic macroeconomic principles imply that, if Indonesians spend less on cigarettes due to increased excise taxes, they will tend to spend more on other items, certainly over the long run (World Bank, 2003). Fewer jobs in the cigarette sector may mean more job in sectors that make products to aid smokers in quitting smoking, for example, or in production of energy drinks high in sugar and stimulants. Thus, to the extent that burdens are imposed on workers or farmers, we should expect these burdens to be temporary. Over the long run, workers who have lost their jobs should be expected to find fruitful alternative uses for their time. Moreover, given the positive income elasticity of demand for cigarettes overall, we should expect that growth in the market for cigarettes will offset at least part of the impact of higher taxes. Finally, if there are decreases in domestic cigarette consumption, there is potential for increased cigarette exports or decreased imports of major inputs, which will also partly offset the short-run burden on the economy.

Nevertheless, substantial short-run dislocations can occur if taxes are increased significantly and rapidly. It clearly is advantageous if policies that can cause significant short-run economic dislocations are enacted during periods in which there is vigorous economic growth overall.

The evidence on the two publicly-listed cigarette companies within Indonesia is that these companies remain profitable, despite the higher taxes of recent years (see footnote 32). This section will consider two other aspects of the economic importance of the cigarette industry: employment and agriculture. Further research on all three of these aspects of the analysis is beyond the current scope of the project, but would be useful.

6.1. Employment Issues

Much is made of the importance of employment in the cigarette sector, notably in the hand-rolled *kretek* industry. We can address this issue based on data on medium and large establishments from the year 2000.

The Central Statistics Agency (BPS) defines the smallest medium-sized establishments as ones that employ as few as 20 workers. For the year 2000, BPS included 210 establishments among those that were medium and large in the *kretek* sectors, and 10 among those that were in the white cigarette sector. Thus, almost all cigarette companies will be included, except for the very smallest.

Total employment figures for medium and large establishments in the *kretek* and white cigarette industries are shown in Table 12.[38] Total employment in these establishments was 0.70 percent of total employment recorded by the government in the year 2000.[39]

To estimate the direct employment effects of increases in cigarette excise tax rates, productivity data for production workers are needed. Such numbers can be calculated from the data on medium and large establishments, but separate data are not available for hand-rolled and machine-rolled *kretek* cigarettes. To approximate the employment effects of changes in output in each of the three cigarette sectors, I use the following approach:

[38] From *Statistik Industri Besar dan Sedang, Indonesia 2000*, Jakarta: Badan Pusat Statistik (March 2002).
[39] Based on *Keadaan Pekerja/Buruh/Karyawan di Indonesia*, Jakarta: Badan Pusat Statistik (August 2000).

- Employment adjustments due to changes in quantity demanded are assumed to occur only among production workers.

- Output per production worker in the SPM sector can be calculated directly from BPS output and employment numbers. Output per production worker in the SKM sectors is assumed to be identical to that in the SPM sector.

- BPS data on output in the SKM sector can then be used to estimate the number of production workers in the SKM sector. This can be subtracted from the total number of production workers in the *kretek* sectors to estimate the number of production workers in the SKT sector.

- Output per production worker in the SKT sector can then be calculated, based on BPS data on SKT output.

Table 13 summarizes the findings. The first row shows output, as recorded by BPS, in number of cigarettes produced in 2000.[40] The second row shows the number of production workers. The third row shows output per production worker.

The productivity figure of 438,370 cigarettes produced per production worker per year in the SKT sector actually matches well with other data on the sector. In particular, the workers who roll the cigarettes work in pairs—one doing the rolling and the other trimming the ends. Industry sources report that each pair of workers can produce three to four thousand cigarettes per day. If we assume 260 workdays per year, and 3500 cigarettes for every pair of workers per day, which is a typical figure, then cigarette output per production worker per year would be 455,000. Thus, the number obtained from the aggregate figures appears remarkably consistent with micro level data.

Rough estimates of the employment impact of increases in the excise tax rate can then be made under the assumption that that average and marginal productivity of production workers are equal.

Consider, for example, Scenario 3 in Table 11, based on the 1999-2002 period, which is the worst-case scenario for employment. If we also assume the worst in terms of exports—that exports of cigarettes do not increase at all—and that the measured elasticities of demand based on recent data are real and not due to tax evasion, then the estimated direct impact on employment of production workers in the cigarette sectors is a loss of 89,756 jobs, with 86,820 jobs lost in the SKT sector.

There is also the question of wages. Table 14 shows year 2000 total monthly compensation per worker for production workers and all workers in the *kretek* and white cigarette sectors, as well as for manufacturing overall. Production workers in the white cigarette sector earned higher-than-average compensation. For production workers in the *kretek* sector, monthly compensation was only 63 percent of that for all manufacturing. However, the relevant question is how workers in the *kretek* sector would be alternatively employed, if they did not

[40] In the case of white cigarettes, these data are not particularly consistent with estimated sales reported by the *kretek* and white cigarette industry associations: the output recorded by BPS for medium and large enterprises in the white cigarette sector was 189.5 percent of the estimated sales figure reported by the industry association. The discrepancies could be accounted for by production for export, the omission of small firms from the BPS data (if the BPS figure were less than the industry figure), and perhaps by illegal activity.

work in that sector. Many would be unemployed or in the informal sector. These workers have voluntarily taken jobs in the *kretek* sector, so it is a good bet they would consider themselves worse off, at least in the short run, if they lost their jobs.

On the other hand, modernization of an economy creates a great many dislocations, and the hand-rolled cigarette industry is an industry in its senescence. To consider an analogy, Indonesia could employ have more workers employed in the coconut oil sector, each using very simple small-scale technology to heat and press coconuts to extract the oil. But productivity and wages of these workers would be low, and the economy would be poorer overall. In the industrial countries, there have been gradual decreases in employment in cigarette production, particularly as increases in income and education have led to decreases in the prevalence of smoking. Over the long run, Indonesia should not resist these trends.

6.2. Agricultural Sector

In the agricultural sector, tobacco and cloves are both primarily grown by smallholders. However, for both of these products, imports have been a substantial proportion of domestic production in recent years. Thus, to some extent we should expect that decreased consumption of cigarettes would translate simply into reduced imports of these items. If there are reductions in land area devoted to tobacco and cloves in Indonesia, the areas for which there are the fewest alternative products will remain in production of these cigarette-related crops the longest, but other areas will be readily shifted to other products.

Clove trees grow from sea level up to more than 1000 meters, and can be grown as a monoculture or mixed with other trees or crops. Clove trees grow well only in relatively rich soils, and prefer sloped areas with good drainage, particularly at lower elevations. The trees are susceptible to disease, and can no longer be cultivated in some areas due to disease problems. Depending on the particular location, the possible alternative crops include coconuts, corn, cocoa, vanilla, and coffee. Indeed, clove farmers are typically highly diversified, with a variety of these crops being grown.[41]

Tobacco tends to grow best in relatively flat areas. Cultivation is highly labor intensive. For example, the seeds are germinated and the seedlings must be transplanted later, and the plants require extensive additional care. Tobacco cultivation also tends to deplete the soil of nutrients. In a typical multi-year rotation, tobacco will be grown on a given plot of land only one year out of three. Alternative crops include garlic, chile peppers, potatoes, other horticultural products, and perhaps fruit trees.

For tobacco production, specialized imported fertilizer may be required. In Indonesia the tobacco companies have typically had formal commercial relationships with farmers, supplying finance and the fertilizer in exchange for a guaranteed market. There have been reports of frictions in these contractual relations: even though the tobacco companies guarantee prices to farmers, some companies reportedly cheat the farmers in their assessments of the quality of leaves. Studies of tobacco sector economics in Indonesia are underway; preliminary indications are that tobacco cultivation is more profitable than some other land uses, but that there are others that are more profitable.

[41] See, for example, Bennett, Marks, and Muslimin (1998).

In summary, the impact on the agricultural sector is not nearly as serious a concern that the direct impact on employment in the cigarette sector. Reduction of imports would be one way for supply-demand balance to be maintained. Moreover, clove and tobacco farmers typically have diverse crop holdings, and can adjust to shifts in demand for particular products.

7. An Unfair Burden on the Poor?

One of the common criticisms of excise taxation of cigarettes in many countries it is a regressive form of taxation: it imposes a disproportionate burden on the poor. This is the general assessment of McCarten and Stotsky (1995), for example.

In the Indonesia context, the only national tax that clearly is not regressive is the income tax. A great number of policies of the government of Indonesia are highly regressive, such as rice import tariffs and the current barriers to importation of sugar.[42] Nevertheless, this issue deserves close examination, and is amenable to empirical assessment. In particular, we should ask whether higher cigarette excise tax rates will worsen any regressivity of this tax. The fact that every scenario presented in Table 11 shows a decrease in total consumer expenditure on cigarettes suggests that higher tax rates will actually make cigarette excise taxes less regressive.

7.1. Cross Section Data on Indonesia

Table 15 shows data from the 2002 national household socioeconomic survey (Susenas) in Indonesia. The rows of the table show households grouped by the distribution of monthly household expenditure per person. For example, the first row shows the poorest 10 percent of households, measured in terms of household expenditure per person. The lowest level of expenditure per person among these households was Rp 28,390 per month. The highest level of household expenditure per person among the households in the table was Rp 21,333,916 per month. (The expenditure figures include not only monetary expenditures, but also household production of various goods and services.)

The third column shows that the median level of expenditure on cigarettes among the poorest 10 percent of households was 4.2 percent of total expenditure. For household in higher expenditure ranges the expenditure on cigarettes was a higher percentage of total expenditure. The median share of expenditure spent on cigarettes peaks at 10.6 percent for households in the 60-80 percentile range. It then diminishes to 7.5 percent for households in the top 10 percent of the distribution of expenditure. Expenditure on tobacco products is thus nearly proportional throughout the distribution of expenditure. This implies that cigarette excise taxation should not be regressive, except insofar as households at the very top of the income distribution have a relatively lighter burden compared to other groups.

The next two columns provide additional perspectives on cigarette expenditures as a share of total household expenditure. The mean level of expenditure for each range of households is higher than the median, which indicates that the distribution is skewed to the right: there are relatively few households in each range that spend much more on cigarettes relative to other items compared to more typical households.

[42] Higher rice prices caused by rice import tariffs hurt not only the urban poor but also typically the poorest members of rural communities in which rice is grown.

In each range of households, the minimum share of household expenditures on cigarettes is zero. The next column of Table 5 shows the maximum share. The household with the highest measured share of tobacco in total expenditure is in the 90-100 percentile range of expenditure per capita. The data on maximum shares of tobacco in total expenditure lead to two observations. One is that some households do indeed bear a significant burden from excise taxation of tobacco, and almost certainly would wish to adjust their behavior if excise rates were raised higher. The other is that we may suspect that households tend to underestimate their total expenditure, since it strains credulity that such high percentages of household expenditure could be devoted to tobacco.

The next three columns show similar statistics for food and beverage expenditures relative to total expenditures. Notice that, in contrast to cigarette taxation, food and beverage excise taxation would be decidedly regressive. Some households at the lower end of the expenditure distribution evidently devote almost all of their expenditures to food and beverages, and there is a strong tendency for expenditure on food and beverages to decrease as a share of total expenditure in higher-income households. Comparison of the median and mean overall indicates that expenditures on food and beverages are slightly skewed to the left. There are a few households with relatively very small shares of their expenditure devoted to food and beverages.

Table 16 presents an alternative perspective on who pays the cigarette excise taxes: it shows the shares in total cigarette expenditures for each of the three varieties of cigarettes and overall, across the distribution of household income per person. For example, of the total amount that was spent on cigarettes, the poorest 10 percent of households spent only 5.2 percent of the total spent on SKT, 2.3 percent of the total spent on SKM, and 3.0 percent of the total spent on SPM. The top 10 percent of households spent the largest amount on SKM and SPM, and nearly the largest amount on SKT, compared to other groups of comparable size. Thus, in absolute terms, it is the highest-income households that spend the most overall on cigarettes.

Table 17 provides more detailed perspectives on cigarette consumption across the income-expenditure distribution:

- The mean price figures suggest that, for all three varieties of cigarettes, lower-income households on average purchase lower-priced brands than do higher-income households: higher-income households in general will be at least as sophisticated as lower-income households, and tend to have greater access to discount retailers, so we should expect that the higher mean prices for higher-income households indicate relatively higher expenditure on popular and prestigious brands.

- The mean quantity figures show similarly that, for all three varieties of cigarettes, lower-income households purchase smaller quantities than do higher-income households, though the difference is far less marked for filterless *kretek* cigarettes (SKT) than for either type of filtered cigarettes (SKM and SPM).

- The mean expenditure share figures in the last three columns are equal to price multiplied by quantity, divided by total household expenditure. For SKM and SPM, these expenditure shares are higher in higher expenditure brackets. However, for SKT, the

expenditure share increases up to the median household, but then decreases for households in higher expenditure brackets.

7.2. Relation to Income and Price Elasticities

To summarize Table 17, lower-income households tend to consume relatively more of lower-cost filterless *kretek* cigarettes. Not only are their prices lower, but their excise tax rates are lower as well. For *kretek* and white filtered cigarettes, quantity consumed generally increases as we move up the expenditure distribution, indicating that these are normal goods (have a positive income or expenditure elasticity of demand). For the bottom half of the expenditure distribution, filterless *kretek* is also normal. For the top half of the expenditure distribution, however, filterless *kretek* cigarettes become an inferior good (have a negative income or expenditure elasticity of demand).

If we consider price to be an index of product quality, given the systematic relationship between price and the distribution of household expenditure per person, then the product of price and quantity (reflected in the mean expenditure share) provides a measure of quality-adjusted quantity consumed. For all three types of cigarettes, quality-adjusted quantities follow the same pattern across the expenditure distribution as do unadjusted quantities.

It is a simple exercise to calculate expenditure elasticities of demand based on these cross-section data. Table 18 shows these expenditure elasticities computed over the entire range of the sample, evaluated at the means of the variables.[43] The calculations are done both for actual quantities of cigarettes consumed, and for quality-adjusted quantities.

As is expected, given the pattern of prices paid across the household expenditure distribution, the measured elasticities are higher if quality-adjusted quantities are used rather than actual quantities. Based on the quality-adjusted data, white cigarettes are a superior good (have an expenditure elasticity greater than one) while filtered and filterless *kretek* cigarettes are normal goods. The expenditure elasticity of demand for filterless *kretek* is relatively low, also as expected.

Finally, there is an important reason for expenditure on cigarettes to be relatively low for households at the lower end of the income distribution: evidence from other countries and from Indonesia indicates that the price elasticity of demand for cigarettes is higher in absolute value among those with lower incomes. For such persons, cigarette smoking may be more of a luxury than an addiction that can be afforded at any price. Thus, we could expect to see relatively large reductions in consumption among lower-income groups due to increases in the excise tax rate.

7.3. Impact of Higher Excise Taxes

How would enactment of the structure of excise tax rates that maximizes revenues change the burden of the tax across the income-expenditure distribution? This issue is complicated by the tendency among lower-income households to spend more on filterless *kretek* cigarettes,

[43] The change in quantity demanded and total expenditure is computed between the highest and lowest 10 percent of households. Percentage changes are then calculated by dividing quantity demand and total expenditure by their respective means.

for which rates of excise taxation would have to be increased the most if maximization of revenue became the sole criterion by which tax rates were set. Thus, we might expect for the impact of these tax increases to be especially heavy for the poor.

All of the scenarios shown in Table 11 lead to lower consumer expenditure on cigarettes in the aggregate. The one scenario that leads to an increase in expenditure on filterless *kretek* cigarettes is Scenario 4, for the period 1999-2002. In that scenario, demand for SKT is less price-elastic than in any other scenario, and the real price of SKT is predicted to go up by 99.1 percent. If any of these scenarios would result in losses for low-income consumers, it is this one.

Table 19 shows the impact on households across the income distribution, if cigarette excise tax rates are increased as shown in Scenario 4 of Table 11.[44] For simplicity, price elasticities of demand are assumed constant across the income distribution. Instead, the total changes in quantities and prices for each variety of cigarettes are used to calculate new expenditure shares for cigarettes for households across the expenditure distribution.

These calculations assume that effective tax rates for all brands of a given variety of cigarettes will increase proportionally, and thus that prices and quantities will change by the same percentage for large, medium, and small firms that produce a given variety of cigarette.

Table 19 shows that even with the large increase in the price of SKT, there is virtually no change in the total share of cigarettes in household expenditure throughout the income distribution.

If price elasticities were allowed to be higher at the lower end of the income-expenditure distribution, consistent with empirical studies, the impact on cigarette expenditures by lower-income households would be even more favorable than shown in Table 19.

8. Health and Related Issues

The evidence is irrefutable that cigarette smoking causes a wide variety of serious health problems. Chaloupka and Warner (1999) report that smoking is responsible for about 90 percent of lung cancer deaths in the United States, 80 percent of chronic bronchitis and emphysema deaths, and is a major cause of stroke and heart disease. Statistics also show that it causes aneurysms, vascular disease, oral-cavity and throat cancer, and is associated with other cancers (esophageal, gastric, pancreatic, renal, and cervical). Smoking slows recovery from injuries or surgery, increases susceptibility to some infections, and can cause vision and hearing problems. It is also, as the official warnings from the Government of Indonesia note, a cause of sexual impotency.

In Indonesia, it was estimated that 68.8 percent of men and 2.6 percent of women aged 20 and older smoked in the year 1995, while among youth aged 15-19 the rates were 15.6 percent for males and 0.4 percent for females (Corrao, et. al, 2000).

[44] Thus, expenditure on SKT increases by 8.7 percent, but on SKM, SPM, and overall it decreases by 7.6 percent, 8.1 percent, and 1.9 percent, respectively.

As a general proposition, most economists would agree that, if consumers were fully informed of all the health risks of smoking, and if smoking had no external effects on other persons, then the market would set the efficient level of smoking without intervention by the government. However, in reality many consumers are not fully aware of the health risks—particularly the young and the less educated. There are also a variety of external effects:

- Prolonged inhalation of environmental tobacco smoke causes lung cancer and heart disease in nonsmokers, and a variety of diseases or health problems in the children of smokers.[45] Smoking by pregnant women results in babies with low birthweight, developmental problems, and increased mortality risks.[46]

- Studies in the United States show that smokers do not bear the full costs of their own additional health care and premature death, even if it is taken into account that their shorter expected lifetimes reduce their demand for health care. Their early deaths reduce the burdens that smokers impose on pension plans, but increase the burdens they impose on life insurance.

- Smokers have a demonstration effect that may encourage others to smoke, particularly the young, who are especially susceptible to peer pressures or appeals from celebrities.

A great number of regulatory, educational, and tax-based approaches have been used around the world to combat smoking. In Indonesia, very limited educational and regulatory steps have been taken.

Restrictions on smoking in public places have not been effectively or uniformly enforced to this point, including at schools, hospitals, places of worship, workplaces and on most public transportation. There is no minimum age requirement for purchasers of cigarettes, nor are there restrictions on single-cigarette sales, which may enable more young people to start smoking. There are no restrictions on the use of words like "mild" or "light" that can mislead the smoker into the belief that a particular cigarette is less harmful to human health.

Cigarette industry regulations allow cigarette commercials to be aired on television only between 9:30 in the evening and 5:00 in the morning, but broadcast regulations allow cigarette commercials during other hours, and enforcement of these regulations is inconsistent. The visual content of these commercials is regulated as well, but companies can develop strong brand images even if cigarette packs or cigarettes are not shown.

Warning labels are required on each pack of cigarettes, and in advertisements and commercials. The standard label reads, "Smoking can cause cancer, heart attack, impotence and disturbances in pregnancy or fetal development."[47] Such warnings may have some beneficial effect: Chaloupka and Warner (1999) note that econometric studies in other countries find that warning labels have reduced smoking by small but significant amounts. However, officials of the World Health Organization (WHO) note that the public tends to become accustomed to inconspicuous warnings, and that varied and more prominent

[45] The U.S. Environmental Protection Agency estimated in 1992 that about 3,000 lung cancer deaths per year and many other respiratory illnesses resulted from environmental tobacco smoke inhaled in the United States.

[46] There is an issue about whether health effects within the family should be treated as externalities. However, almost certainly the smokers themselves do not bear all of these costs.

[47] A potential problem in the case of the Indonesian warning is that young men who find that their sexual potency is unaffected by smoking may tend to discount all of the warnings.

messages, or even photographic documentation of the health consequences of smoking, are more effective.

Developed countries required cigarette manufacturers to disclose the tar and nicotine content of their cigarettes on the pack, but such disclosure rules have not been enacted by Indonesia.[48] However, white cigarette manufacturers generally voluntarily disclose tar and nicotine content on their packs. For example, Ardath Filters from British American Tobacco report that each cigarette contains 16 mg of tar and 1.3 mg of nicotine, while Marlboro Filters from Philip Morris report 14 mg of tar and 1.0 mg of nicotine.

Most *kretek* brands, filtered and filterless, do not report tar and nicotine content on the pack. One exception is Dji Sam Soe Filters from Sampoerna, which reports 36 mg tar and 2.0 mg nicotine. The A Mild brand from Sampoerna reports 14 mg tar, and 1.0 mg nicotine.[49]

There is a further complication in that an additional powerful chemical, eugenol, comes from the cloves in *kretek* cigarettes. The health effects of eugenol at this point are not known, though it is suspected of being a carcinogen. A study conducted by Sampoerna in 2003 reported machine measurements of chemical content for a variety of *kretek* brands. For major brands included in the study, nicotine content per cigarette ranged from 2.1 to 2.5 mg, tar content from 45.0 to 53.2 mg, and eugenol content from 8.56 to 12.10 mg.[50]

As noted earlier, the poor are able to avoid high cigarette excise taxation by the purchase of filterless hand-rolled *kretek* cigarettes, particularly from small companies. Thus, in a sense, the excise tax system at present is very efficient, in that it delivers relatively large amounts of nicotine to low-income smokers at relatively low cost. However, the unfortunate reality is that this comes at the cost of increased exposure to tar and other harmful substances that could otherwise be reduced by filtration.

One of the basic problems for Indonesia is that cultural norms so far have not strongly opposed smoking. An additional problem is that regulatory enforcement takes effort and resources. Excise taxation of cigarettes is an attractive approach in that it provides a direct financial inducement for the government to restrict smoking indirectly. Committed taxation of cigarettes also may be able to contribute to the evolution of cultural norms. Over the long run almost certainly the optimal approach will involve a combination of education, regulation, and taxation, with strong efforts required in all three areas.

9. Multiple Rates of Taxation

As noted earlier, there are multiple rates of taxation for cigarettes in Indonesia. Excise tax rates are set for each variety of cigarettes, and each size of producer, and applied to official retail prices set for each brand by the Excise Directorate. There are preferences for smaller producers, and preferences for the more labor-intensive hand-rolled *kretek* producers.

[48] Tar is actually a composite of thousands of chemical substances, many of which are carcinogens. Nicotine is the primary addictive chemical in cigarettes.

[49] WHO officials and other observers note that, to the extent that cigarettes are a nicotine delivery vehicle, if a particular brand of cigarettes offers less nicotine per cigarette, then the typical smoker may simply smoke more of those cigarettes to get additional nicotine. Thus, machine-based tests of chemical content of cigarettes may be misleading.

[50] I define major brands in this case as being those from Gudang Garam, Sampoerna, Djarum, or Bentoel.

9.1. General Issues

The setting of excise tax per unit on a brand-specific basis is perhaps the least transparent and most problematic aspect of these multiple excise tariffs. The lack of transparency appears to be an invitation to corruption in the form of firm-specific concessions made in return for fees paid to officials. For example, for a number of brands there evidently are small deviations between the official retail prices listed on the excise ribbons and the spreadsheet formulas used by the Excise Directorate to predict revenue yields:[51] the actual official retail prices listed on the excise ribbons in many cases are 100 to 200 rupiah per pack less than the formulas would imply. It could be that these deviations have an innocent explanation, or that they reflect corruption that has reduced revenues to the government of Indonesia. This issue clearly deserves further investigation.

As one discipline on setting effective tax rates on a brand-specific basis, it is important to compare official prices with typical market prices for the various brands. Thus, it is useful to refer back to Table 4. Notice in particular that there was considerable variation in the average official price premium across brands:

- Among hand-rolled *kretek* cigarettes, the popular Dji Sam Soe brand manufactured by Sampoerna was an outlier, with the average market price nearly as high as the official retail price. On the other hand, two brands experienced much higher official price premiums than did any other.

- Among machine-rolled *kretek* cigarettes, Dji Sam Soe filter also exhibited a relatively low price premium, along with Sensasi Klasik from Bentoel and especially Minak Djinggo Filter from Nojorono. Two brands from Djarum and the Brown brand from Stevania were subject to relatively high official price premiums.

- Among white cigarettes, considerable variation in these premiums is observed as well, with two brands selling at particularly deep discounts.

Whether these variations in official price premiums represent a problem is a difficult question. Certainly these deviations raise suspicions that officials may be favoring certain brands in return for kickbacks. On the other hand, the relative structure of official retail prices has been more or less set for some time. Each year in the recent past, official prices within each of the size categories and for each of the cigarette varieties have been raised in concert, either by a given percentage or by a given absolute amount of rupiah per cigarette.

Thus, as an alternative to any conspiracy theory, it could be that in the relatively depressed market conditions of the recent past, some brands have been favored more than others by consumers. Moreover, if demand for filterless *kretek* cigarettes has been relatively strong compared to filtered *kretek* or white cigarettes, perhaps because many consumers experienced lower real incomes in recent years and thus have looked for lower-priced cigarettes, this could explain why the average official price premium is lower for filterless kretek cigarettes than for the other two types. The Excise Directorate could then be in a bind politically: the

[51] These formulas are based on the past official price of each brand and the most recent annual increment to this price.

data seem to indicate that adjustment of official retail prices among the various brands is required, but to do so could raise additional questions about whether the process was done cleanly.

9.2. Preferences for Smaller Firms

Table 3 showed the preferences in the nominal cigarette excise tax rate structure that favor smaller companies, both in terms of nominal tax rates and minimum official retail prices. However, the difference in minimum official retail prices is a complex issue, since market prices could naturally be relatively high for cigarettes from large companies. There is no reason to suspect that production is subject to diseconomies of scale or scope.[52] In particular, if larger firms experienced significantly higher costs per unit produced, we would not expect large firms to dominate the market. Thus, the difference in prices can more reasonably be presumed to be a function of product differentiation: cigarettes produced by smaller companies typically could be perceived by consumers to be of lower value in terms of their physical characteristics or their brand image or both. An alternative interpretation is that the brand name capital accumulated by large producers has been capitalized into their product prices.[53] In either case, it would be natural for prices of cigarettes from large companies to be relatively high.

In support of this view, Table 20 shows that there are systematic differences not only in the official retail prices for large, medium, and small producers of all three types of cigarettes, but also in their implied supply prices, calculated as $P_S = P_O \times (1-t)$, where P_O is the official retail price and t is the relevant tax rate.[54] In particular, for all three types of cigarettes, supply prices per cigarette are higher for large companies than for medium and especially small companies. This suggests then that the differences in prices between large and small companies are natural to some extent, but also are widened by the higher rates of taxation that are applied to large versus small companies.

A question that remains to be answered is whether official retail prices are higher relative to market prices for large companies compared to smaller ones. A more extensive market survey like the one featured in Table 4 could determine the extent to which official price premiums differ between large, medium, and small producers of each type of cigarettes.

Despite the evident tax preferences that small companies enjoy, large companies have dominant market shares for all three varieties of cigarettes in Indonesia. Table 21 shows the market shares, in each of the three markets and overall, of large, medium, and small companies as defined by the Excise Directorate and as shown in Table 3.[55] Table 21 shows, for example, that of the 37.1 percent of industry sales contributed by white cigarettes, 75.6 percent came from large companies. Large companies had a 76.1 percent market share in the cigarette sectors overall.

[52] In other words, there is no reason to suspect that companies that produce more cigarettes or more varieties of cigarettes are subject to higher costs per unit.

[53] This brand name capital would be enhanced by advertising and promotion, but could also be related to the spread of the reputation of a brand by word of mouth.

[54] In the absence of complete data on actual market prices of all brands, it is assumed that official prices and market prices are identical.

[55] In particular, Table 21 does not gather companies into groups based on common ownership.

Table 22 shows the number of distinct firms in each product category and overall, based on the 2002 classification. Most large and some smaller *kretek* producers have products in both the filtered (SKM) and filterless (SKT) markets, and two large *kretek* company have entries in the white cigarette market, so that the number of companies in the market overall is smaller than the sum of companies in each of the three markets.

The setting of multiple tax rates for firms of various sizes, with smaller firms paying the lowest rates, may have advantages, but certainly these multiple rates do not enhance efficiency, transparency, or tax revenue yields:

- Economic analyses tend to indicate that, even with a concentrated industry structure in which there are as few as three or four main competitors, competition may be able to thrive. Active competition from imports may even be able to discipline a domestic monopoly. On the other hand, there is an illusion of competition if differential tax rates allow small, inefficient firms to survive without being subject to competitive pressure. Small companies are also in effect punished for growing larger, which would undermine one of the important dynamic inducements for greater efficiency in a market economy.

- The differential tax rates may allow larger companies to find ways to divide their product lines among separate companies to take advantage of the lower tax rates that are presumably intended for smaller companies. Such practices are not prohibited under current law.

  - The Bentoel Group has two major subsidiaries for cigarette manufacturing. One is Lestari Putera, which produces the popular Star Mild brand, a filtered *kretek* cigarette. The other is Bentoel Prima, which produces Bentoel Mild, also a filtered *kretek* cigarette. The excise directorate classifies producers based on company size rather than group size, so the former is classified as a large producer, but the latter as a medium-sized producer. Similarly, in 1992 Djarum set up Filasta Indonesia, which in 2003 was reclassified as a large company in its own right, and in 1993 set up Wikatamah Indah, now a medium-sized company. In addition, the principal owner of Gudang Garam reportedly owns some smaller cigarette companies as well.

  - The differential tax rates allow large companies to enjoy low rates of taxation in markets in which they are not large. For example, Gudang Garam and Sampoerna have brands in the white cigarette market classified as being from small companies. Bentoel is classified as a medium-sized company in the filtered *kretek* (SKM) market, but a small company in the filterless *kretek* (SKT) market. Similarly, its Lestari Putera subsidiary is a large company in the filtered *kretek* market, but a small company in the filterless *kretek* market

- There are concerns that small or medium-sized companies may be buying extra excise tax ribbons for resale to other companies that can thus avoid being classified as larger producers, and thus avoid being subject to higher effective tax rates. For the practice to be hard to detect, the two companies would have to have brands that had the same official retail prices (which are specified on the excise ribbons). Such a practice is not illegal under current law.

- A regulation from the early 1990s prohibits the subcontracting of existing brands of cigarettes, but such a rule is easily circumvented and could lead to the proliferation of otherwise identical brands.

- The setting of differential tax rates confers considerable discretion on tax officials, who in principle could manipulate the official definitions of small, medium and large firms so as to favor certain companies, from which a fee would be expected in return. The identities of which companies are classified as small, medium, and large is one of the less transparent aspects of excise taxation of cigarettes.

In fairness to excise officials, the current dividing lines between size classifications are round numbers that are similar for each variety of cigarettes, as discussed earlier. Based on examination of company-by-company data from the Excise Directorate, one can see a certain logic to these divisions.

There is perhaps an exception in the case of hand-rolled *kretek* cigarettes, for which there is an extra classification for very small companies with output of six million cigarettes or less. These companies in 2002 paid no excise tax at all, but now pay a four percent tax. It is unclear why the line is drawn at six million. About 42 companies had output below that level in 2002, but about 14 other companies had output below ten million cigarettes, for example, and some were very close to the dividing line.[56]

Perhaps two economic arguments could be set forth in favor of differential rates of taxation that favor smaller companies. One is that product variety could be enhanced. This greater variety could allow lower-income consumers in certain areas to obtain less prestigious and popular brands of cigarettes at lower cost, particularly due to the lower excise tax rates. The availability of such products would limit any tendencies for the tax to be regressive, but it would also limit the ability of the tax system to influence consumer behavior in such a way that the health problems and related economic inefficiencies associated with smoking would be reduced.

The reality is that many of the brands produced by smaller *kretek* companies are imitations of popular brands that would not survive the stricter trademark protections in the courts of industrial nations.[57] A question for further research is whether any of these imitation brands are produced with the consent of, or even at the initiative of, the large companies.

The other argument is that smaller firms have certain competitive disadvantages, but that their participation in the industry benefits society. For this argument to be rigorous in economic terms, it must be premised on the existence of one or more market failures.[58]

- The argument that large firms would drive small firms from the market is not in general a persuasive one. Policies that influence the competitive environment should be designed to protect competition, not competitors. If smaller firms are unable to compete on an equal footing, their presence will not lead to competition that is beneficial to consumers

[56] The reason for the uncertainty about the number of companies is that these calculations by the author are based on excise directorate data for the first half of 2002 only.

[57] A standard joke in rural areas is that one serves the popular brand to guests during daylight hours, but the low-cost imitator after dark. However, there are taste differences as well.

[58] A general definition of a market failure is that social costs of some item differ from its private costs. Thus, behavior that is optimal for private parties is not optimal for society.

anyway. Moreover, without the possibility of failure, firms will not have strong incentives to improve their competitiveness. On the other hand, if larger firms are accused of using unfair tactics to drive out the competition, Indonesia has an anti-monopoly law and an anti-monopoly agency in the KPPU (*Komisi Pengawas Persaingan Usaha*) that have been established to handle such issues.

- Perhaps the most persuasive argument for the existence of market failure in the cigarette industry is that information problems or imperfect competition in credit markets could imply that larger firms enjoy easier access to lower-cost credit than do smaller firms. The most efficient way for policy makers to handle such a market failure would be to correct it directly via remedies in credit markets. However, a feasible but less efficient alternative would be to provide some other means of support to small producers, such as the excise tax preferences that smaller cigarette companies enjoy. In any case, once small producers have had an extended period to become more competitive and credit-worthy, the support should be reduced and eventually eliminated. Otherwise, there are permanent efficiency costs to the economy.

9.3. A Simpler Alternative Tax System

The multiplicity of ad valorem equivalent tax rates in the cigarette sector is clearly harmful to both economic efficiency and transparency, and almost certainly reduces tax revenue yields. At this point in its development, Indonesia may find that transparency and reduction of corruption are more important than efficiency gains, though all should be high priorities. Thus, an important tax reform in the cigarette sector will be to reduce the discrepancies among excise tax rates in general, and specifically to get away from setting brand-specific taxes.

In commodity taxation, there are two main alternatives: ad valorem taxes that depend on the value of a product, and specific taxes that are a fixed monetary amount per unit. The present system of excise taxation of cigarettes in Indonesia is a hybrid of these two approaches: general percentage tax rate schedules are applied based on the type of cigarette and the size of producer, but these percentage rates are then multiplied by brand-specific official prices to calculate the actual amount of tax to be paid per pack.

For cigarettes, specific taxes are used in many countries, such as the United States. One potential disadvantage of specific taxes is that producers may find ways to circumvent them, primarily by making larger cigarettes. However, this could be an issue in Indonesia even under the present hybrid system, if market prices are well below the official retail prices: producers could have considerable leeway to enlarge their cigarettes, and charge higher prices, without triggering an increase in the official retail price.[59]

One way to limit the enlargement problem under a specific tax system would be to adjust the specific tax each year, based on the average market value of cigarettes in a given category. This would be a lot simpler than the current system, in which there is an official retail price for each individual brand. Cigarette producers would each have incentives to add to the

[59] The other reason to keep the official retail prices more in line with actual market prices is greater transparency: it is better for all parties to have an accurate sense of the effective tax rate.

content of their cigarettes so as to reduce their tax liability.[60] On the other hand, competition among cigarette producers and the nature of the product would eventually limit this process. A pack of cigarettes should fit comfortably in a shirt pocket, for example. These market-based limitations on cigarette enlargement would be especially effective if manufactures were required to disclose harmful chemical content on their packs, which would tend to put larger cigarettes at a disadvantage.

It must be acknowledged that setting a single specific tax per cigarette for all cigarettes would make the percentage tax rate highest for lower-priced cigarettes, and would especially hit hard the small producers of hand-rolled cigarettes, who have enjoyed substantial preferences to this point. It would also tend to make cigarette excise taxation more regressive.

One brand in particular seems to present problems in this respect: Sampoerna sells a special version of its Dji Sam Soe brand, in which each cigarette is individually packaged, presumably to maintain the utmost freshness, but perhaps also to offer opportunities for the buyer to engage in conspicuous consumption. The official retail price is Rp 14,500 per pack of 16 cigarettes, and market prices have held close to that level. A specific tax on all cigarettes would translate into a very low percentage rate of taxation on this luxury brand.

Does this make sense? Arguably it does, if we consider that the cigarettes being sold are essentially identical to cigarettes that sell for much less. The tax presumably applies to cigarettes, not to packaging, and thus it would be reasonable to apply the same specific tax in this case. However, if there were concerns about fairness, a special higher specific tax could be set for cigarettes that are individually packaged.

Tables 23 and 24 reproduce the scenarios shown in Table 11, but with two simpler excise tax structures. Table 23 shows the single percentage rate of taxation for all varieties of cigarettes that would maximize tax revenues. Such a system would continue to require that official retail prices be set by the Excise Directorate. Table 24 shows the single specific tax per cigarette for all varieties of cigarettes that would maximize tax revenues. Implementation of this tax would not require that official retail prices be specified. In each of these cases, it is presumed that companies of all sizes would pay the same percentage tax rates (Table 23) or the same amount of tax in rupiah per cigarette (Table 24).

Because each of these alternative policy regimes imposes constraints on the policy instruments (tax rates) that do not exist in the original revenue maximization exercise shown in Table 11, the increases in revenues shown in Tables 23 and 24 are smaller in all scenarios than their counterparts shown in Table 11.

Table 23 shows that, with a single percentage tax rate for all cigarettes, the rate that maximizes revenues would be about 55 percent based on the 1999-2002 period or about 44 percent based on 2001-02. Table 24 shows that, with a single specific tax for all cigarettes, the tax that maximizes revenues would be about 245 rupiah per cigarette based on the 1999-2002 period or about 160 rupiah per cigarette based on 2001-02. The optimal specific taxes shown in Table 24 are of similar magnitude in percentage terms to the optimal percentage rates shown in Table 23.

[60] Such incentives are presumably limited under the current system. For a given brand, enlargement of the cigarettes will entail higher market prices. However, higher in market prices will soon be reflected in an increase in the official retail price and thus in the effective tax rate.

The specific tax could be adjusted annually to account for changes in prices of cigarettes, in order to hold it constant as a percentage of the surveyed value of cigarettes overall. Alternatively it could be held constant in real terms by adjusting for inflation.[61]

Tables 23 and 24 both show that, based on price elasticities over 1999-2002, the respective constraints on excise tax setting generally do not reduce potential revenue increases by much. On the other hand, the price elasticities over 2001-2002 tended to imply that percentage rates of taxation should be more different for the three varieties, and thus the constraints limit potential revenue expansion more substantially.

Does this observation lead us to the conclusion that revenues definitely would not increase as much under these alternative tax systems compared to the system reflected in Table 11? Certainly not. The simplification of the tax system in Table 24 in particular could easily mean that in practice revenues would increase more than calculated strictly based on supply and demand, due to concomitant improvements in administration and enforcement.

An alternative policy analysis would be to design a simpler tax system that on paper maintains the current level of revenues, wither through a single ad-valorem rate or a single specific tax per cigarette. Such a system would not be as radical a change as the policies that seek to maximize revenues, whose consequences are depicted in Tables 23 and 24. It could easily be derived from the framework used in this analysis, under the various scenarios shown in the tables, or under some alternative plausible scenarios. In effect, such a scheme would provide significant reforms that should improve governance, but presumably would not lead to a significant change in revenues.

10. Concluding Remarks

This paper does not seek to make specific recommendations to the government of Indonesia. However, it is worthwhile to summarize the main conclusions of the paper, and to make a few suggestions, especially for further study.

The conservative estimation procedures used in this paper found that maximization of cigarette excise revenues will require generally higher rates, especially for hand-rolled *kretek* cigarettes.

- Regressivity concerns are not very serious for cigarette taxation, certainly compared to other forms of commodity taxation.

- The direct employment consequences for the SKT sector are arguably a more serious concern than are the impacts in agriculture.

If there are to be changes in the overall cigarette excise tax rate structure, there is the question of the pace of these adjustments. Several arguments weigh in favor of moving slowly:

- There are bound to be short-run economic dislocations, particularly in the hand-rolled *kretek* sector. If the overall rate of economic growth increases in the future, these dislocations will be less of a concern.

[61] Both of these goals (constant percentage rate and constant in real terms) could be met only if prices of cigarettes increased at the overall rate of inflation (remained constant in real terms).

- There is a reasonable probability that the price elasticities of demand for cigarettes over the long run will be higher than the elasticities used in this paper, as youth may be deterred from smoking. In addition, vigorous enforcement of regulation and taxation of cigarettes, as well as public education, may gradually contribute to the shifting of cultural norms away from tolerance of smoking, as continues to occur in the industrial nations. For this reason as well, demand would effectively be more elastic in the very long run than in the short run.

- Enforcement is a major issue. It could be better to improve governance in general, and in tax administration in particular, before pushing markets farther away from free-market equilibrium prices and quantities.

However, there are also several arguments that favor moving more rapidly:

- Compliance with the recent Framework Convention for Tobacco Control will require Indonesia to take into account the health costs of smoking in its setting of tax and price policies.

- The cigarette companies will make a gradual transition a difficult one politically. One of their most potent political weapons has been the importance of employment in the SKT sector. If the sector diminishes in size due to a rationalization of the excise tax rate structure, then their political power will diminish as well.

- For society in general, the total costs of smoking arguably outweigh the benefits, as tends to be the case in other countries. If so, the sooner that smoking can taxed more effectively, the sooner cultural norms can evolve away from tolerance of smoking and the more prosperous the society can become. This issue deserves comprehensive study in Indonesia.

Reduction or even elimination of the multiplicity of excess tax rates would make the cigarette excise tax system more efficient and more transparent. There are a number of issues in this regard:

- The low tax rates imposed on small companies, and on producers of hand-rolled *kretek* cigarettes, create a huge weakness in the cigarette excise tax system. It enables many companies and consumers to circumvent excise taxes. This has negative revenue and health implications, though it does favor employment, particular in small companies in the SKT sector.

- How many of the smaller cigarette companies are genuinely independent companies, and how many are devices created to reduce the tax liabilities of larger companies? Does the existence of these small companies in an environment that does not promote competition actually benefit Indonesia? Further study of these issues would be very useful.

- How much is the survival of these smaller companies threatened by rationalization of the cigarette excise tax rate structure? Arguably the economies of scale in cigarette production are limited, so that the most efficient of these smaller companies could survive, even if they had to pay tax rates comparable to those paid by larger companies. This issue also merits further study.

Appendix: Theoretical Considerations for Revenue Maximization

1. Tax Revenues and the Elasticity of Demand

Let e_P be the price elasticity of demand for a product, defined as the percentage change in quantity demanded divided by the percentage change in price, $\%\Delta Q / \%\Delta P$.

An early lesson in economics is that, if demand for a product is price elastic ($-\infty < e_P < -1$), then an increase in the price of the product will lead to a decrease in total consumer expenditure ($P \times Q$). If demand is unit elastic ($e_P = -1$), then an increase in price will not change consumer expenditure. If demand is inelastic ($-1 < e_P \leq 0$), then an increase in price will lead to an increase in consumer expenditure.

Total consumer expenditure is equivalent to the total revenues obtained by producers, and by the government if there are any excise taxes or similar taxes on the product. However, an increase in the price of a product will not necessarily lead to a decrease in tax revenues, even if demand is inelastic. This point is demonstrated in Figure A.1, which examines an excise tax on some product. Suppose the supply price, P_S, is constant. With an initial tax per unit of T_0, the price to consumers will be $P_D = P_S + T_0$. At the price P_0 along the demand curve, demand is elastic.[62] At prices higher than P_0, demand becomes even more elastic.

Suppose now that the excise tax is raised from T_0 to T_1 per unit. Price rises from P_0 to P_1, and quantity drops from Q_0 to Q_1. Because demand is elastic in the range above P_0, it follows that consumer expenditure falls:

$$P_1 \times Q_1 < P_0 \times Q_0.$$

Alternatively, area A shows increased consumer expenditures on the Q_1 units that are still consumed, due to the increase in price from P_0 to P_1, while the sum of areas B and C shows the lost consumer expenditures on the $Q_0 - Q_1$ units that are no longer consumed, but for which consumers previously paid price P_0. The decrease in consumer expenditure is reflected by $A < B + C$.

On the other hand, tax revenues were initially $T_0 \times Q_0$, but now become $T_1 \times Q_1$. Thus, if we wish to determine whether tax revenues have increased we must determine whether area A is larger or smaller than area B. It turns out that $A > B$ in this case, which indicates that tax revenues have increased.[63]

2. Excise Tax Rates that Maximize Cigarette Excise Revenues

The text noted that linear demand will provide more conservative conclusions, in the sense that with linear demand we will find tax revenues maximized at lower excise tax rates than would be the case with constant-elasticity demand, all else equal. Linear demand will also imply lower estimates of the revenues to be gained through taxation.

[62] Demand is actually unit elastic at P_0, which can be easily demonstrated geometrically.

[63] In Figure 1, area B is about 60 percent of area A and area C is about 75 percent of area A. Thus, $A < B + C$, but $A > B$.

As an illustration of these two points, consider a single commodity that is to be taxed, for which the initial tax rate is zero. The situation is shown in Figure A.2. The supply price is constant and equal to 20 and the initial quantity transacted is 80. The price elasticity of demand is -2 at the initial equilibrium. The constant-elasticity demand curve shown has a price elasticity of –2 at all points and runs through the initial equilibrium point. The linear demand curve has a price elasticity of –2 at the initial equilibrium, but the elasticity increases in absolute value as the price is increased.

If an excise tax is imposed, and we seek to maximize tax revenues, the linear demand assumption leads us to a tax of 5 per unit. Thus, the market price rises to 25, quantity transacted falls to 40, and total tax revenues are 200. On the other hand, the constant-elasticity assumption leads us to a tax of 40 per unit. The market price rises to 60, quantity transacted falls to 20, and total tax revenues are 400.

Thus, the linear demand specification does not reward high taxes as much, and does not yield as high revenue estimates, compared to the constant-elasticity specification. If we estimate that, using a linear specification, tax revenues can be substantially enhanced through higher tax rates, we can have more confidence in this conclusion than if we had used a constant-elasticity specification.

3. A Symmetry Restriction on Cross-Price Elasticities

Consumer theory distinguishes between ordinary demand, which is a function of prices and income, versus compensated demand, which is a function of prices and utility. Ordinary demand is directly observable, while compensated demand is not, since utility cannot be directly observed.

Suppose for example that the price of cigarettes goes up, all else held constant. This will not only cause the relative price of cigarettes to increase, but will also cause consumers' real income to decrease. The compensated demand curve indicates the hypothetical quantity of cigarettes that would be demanded at the new price if real income were held constant. Real income is held constant in the sense that utility is held constant: we suppose for the sake of the analysis that enough additional money income would be provided so that the consumer is indifferent between the initial and new situations.

The symmetry restriction mentioned in the text follows from utility maximization. It is the requirement that the compensated price elasticity of demand for good *i* with respect to the price of good *j* (call it *E(ij)*) is equal to the compensated price elasticity of demand for good *j* with respect to the price of good *i* (call it *E(ji)*). To operationalize this restriction, the compensated price elasticity of demand for good *i* with respect to the price of good *j* can be expressed in terms of the ordinary elasticity of demand for good *i* with respect to price of good *j* ($e_P(ij)$), the ordinary income elasticity of demand for good *i* ($e_I(i)$), and the share of income spent on good *j* ($s(j) \equiv p_j \times x_j / I$):

$$\text{(A1)} \quad E(ij) = e_P(ij) + e_I(i) \times s(j)$$

If the symmetry restriction that $E(ij) = E(ji)$ is imposed, then it follows that

$$\text{(A2)} \quad e_P(ij) + e_I(i) \times s(j) = e_P(ji) + e_I(j) \times \sigma(i)$$

Thus, if we can make an assumption about the income elasticity of demand for each good, and if there are data on the expenditure share for each good,[64] then the restriction amounts to a linear relationship between the cross-price elasticities of ordinary demand.

In the case of the three varieties of cigarettes, there will be three equations like (A2): one for SKT and SKM, one for SKT and SPM, and one for SKM and SPM. Thus, there are three equations but six unknowns—the six cross-price elasticities of ordinary demand. The assumption that the sum of the two cross-price elasticities of demand for each good is equal to some fixed number then reduces the effective number of unknowns from six to three, and the system can be solved.

To obtain the actual solution to this system of equations, it was simplest to create a loss function equal to the sum of the squared differences between *E(ij)* and *E(ji)* for *i*, *j* = SKT, SKM, and SPM ($i \neq j$):

$$[E(SKT, SKM) - E(SKM, SKT)]^2 + [E(SKT, SPM) - E(SPM, SKT)]^2 + [E(SKM, SPM) - E(SPM, SKM)]^2$$

The Solver add-in routine in Excel was then used to find the ordinary cross-price elasticities of demand that drove the value of this loss function to zero, which assured that all three pairs of compensated cross-price elasticities satisfied the restriction.

[64] The expenditure shares were calculated by finding the shares for each variety of cigarettes in total cigarette expenditures, and then assuming the share of cigarettes in overall expenditure to be equal to the mean share of cigarettes in expenditure based on the 2002 National Socioeconomic Survey (Susenas). This mean share is 9.7 percent, as shown in Table 15.

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Figure 1. Real Cigarette Prices, 1990-2002 (1996=100)

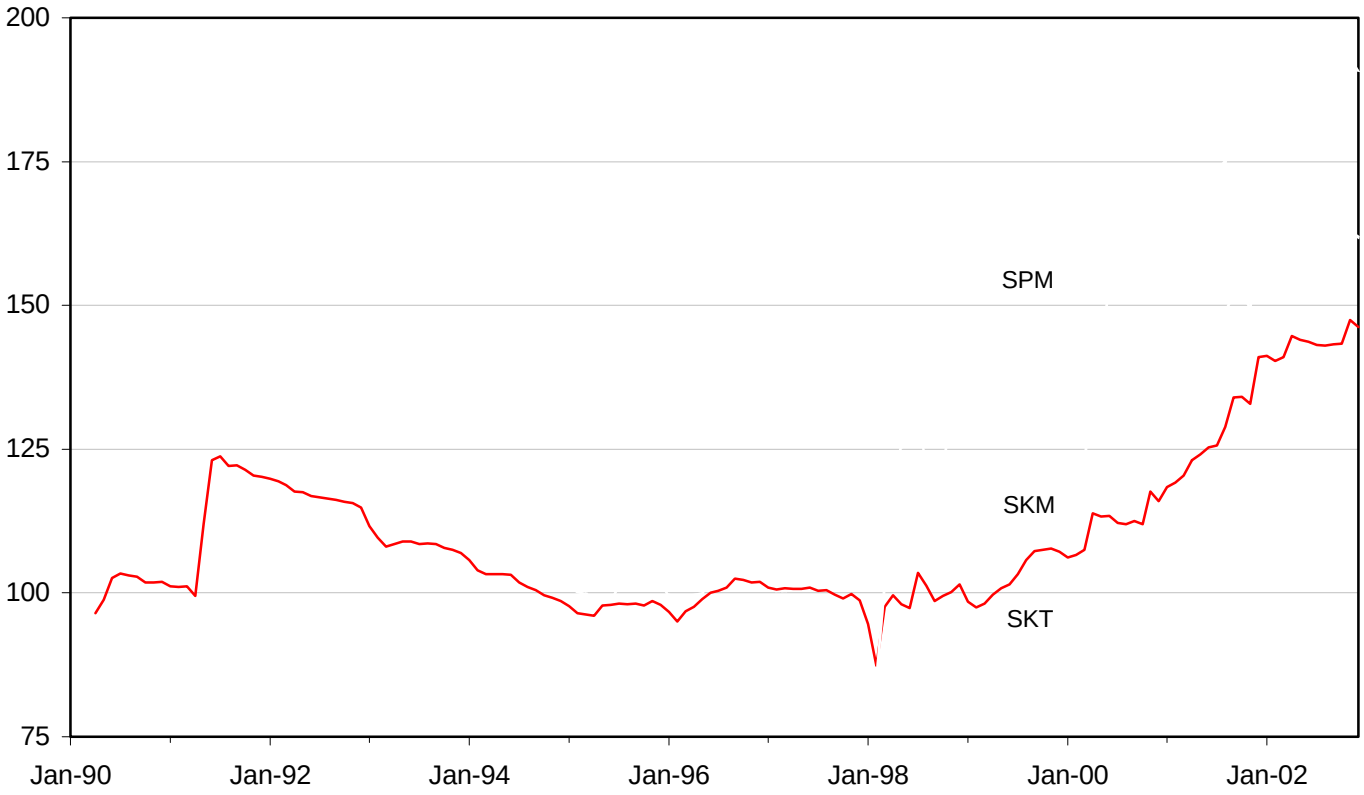

Figure A.1. Increase in an Excise Tax

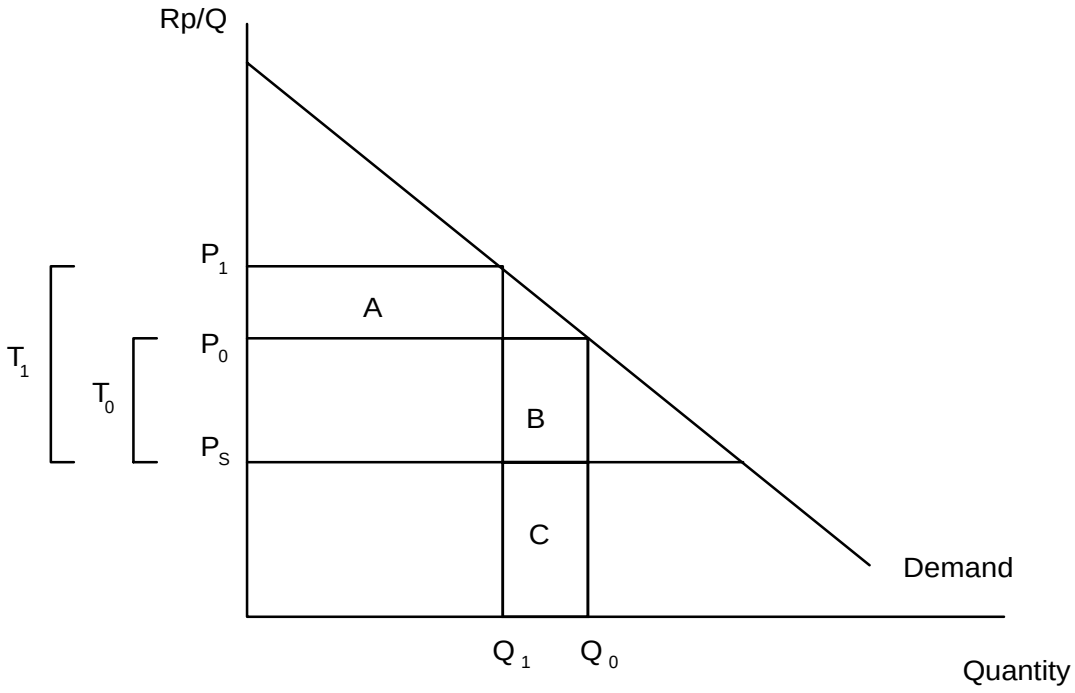

Figure A.2. The Excise Tax that Maximizes Revenues:
Linear Demand vs. Constant-Elasticity Demand

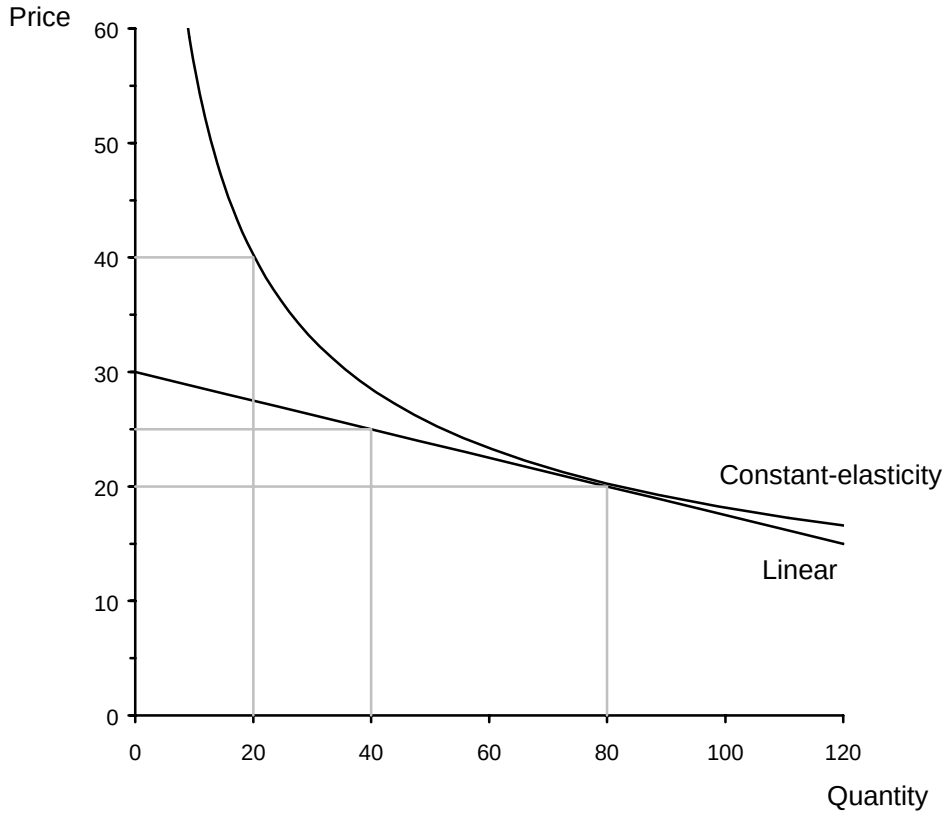

Table 1. Tobacco Excise Revenues in Indonesia since 1990

Fiscal Year[1]	Nominal (Rp billions)	Real (1995 Rp billions)	Percentage of Tax Revenues	Percentage of GDP
1990	1,714	2,627	6.96	0.81
1991	1,703	2,386	6.23	0.68
1992	2,116	2,757	6.44	0.75
1993	2,470	2,934	6.66	0.75
1994	2,648	2,897	5.17	0.69
1995	3,451	3,451	5.74	0.76
1996	4,061	3,761	6.36	0.76
1997	4,893	4,246	6.14	0.78
1998	7,459	4,106	6.49	0.78
1999	10,113	4,620	6.86	0.91
2000	11,089	4,884	7.26	0.93
2001	17,336	6,848	9.34	1.20
2002	22,900	8,222	10.89	1.42

[1] Fiscal years switched from an April 1 - March 31 basis to a calendar year basis in 2000.

Table 2. Decomposition of Real Tobacco Excise Revenue Growth since 1990, Annual Rates

Fiscal Years	$\%\Delta R$	$\%\Delta Q$	$\%\Delta P$	$\%\Delta\tau$
1990-91	-9.1	-3.6	13.3	-18.7
1991-92	15.6	2.6	1.9	11.1
1992-93	6.4	3.8	-6.0	8.7
1993-94	-1.1	11.7	-5.8	-7.0
1994-95	19.1	5.4	-4.2	17.8
1995-96	9.1	5.6	1.8	1.7
1996-97	13.7	13.9	-0.6	0.4
1997-98	-3.5	-1.6	7.4	-9.3
1998-99	12.3	2.0	8.8	1.5
1999-00	5.7	-1.0	8.6	-1.9
2000-01	40.2	-0.4	12.6	27.9
2001-02	17.9	-10.6	9.9	18.5
1990-02	9.9	2.1	3.8	4.0

Table 3. The Cigarette Excise Tax Structure in Indonesia, 2003

		Percentage Tax Rate			Minimum HJE per Cigarette		
Company Tier	Cigarettes Sold per Year (Q)	SKT	SKM	SPM	SKT	SKM	SPM
Large	Q > 2 billion	22	40	40	340	400	270
Medium	500 million < Q ≤ 2 billion	16	36	36	280	330	210
Small	Q ≤ 500 million	8	26	26	270	320	200
Tiny	Q ≤ 6 million	4	n/a	n/a	200	n/a	n/a

n/a: not applicable

Table 4. Survey of Retail Cigarette Prices, Assorted Brands, Central Jakarta, 23-26 May 2003

Producer	Brand	Cigarettes per Pack	Excise Tax Rate (%)	Official Retail Price (Rp per pack)	Average Market Price (Rp per pack)	Average Official Premium (%)	Average Effective Tax Rate (%)
Hand-Rolled Kretek Cigarettes (SKT)							
Djarum	76	12	22	4800	4325	12.2	24.7
Djarum	"Coklat"	12	22	4800	4238	14.2	25.1
Gelora Djaja	Wismilak	12	16	5900	5000	18.0	18.9
Gudang Garam	"Merah"	12	22	4800	4035	19.4	26.3
Nojorono	Minak Djinggo	12	22	3400	3033	13.3	24.9
Sampoerna	Dji Sam Soe	12	22	6500	6454	1.0	22.2
Sampoerna	"Hijau"	12	22	5000	4465	12.4	24.7
Machine-Rolled Kretek Cigarettes (SKM)							
Bentoel	Mild	16	36	6500	5675	14.6	41.3
Bentoel	Sensasi Klasik	12	36	4500	4150	8.7	39.1
Djarum	Black	16	40	7700	5831	32.7	53.1
Djarum	L.A. Lights	16	40	7700	6125	27.1	50.8
Djarum	Super	12	40	5900	5288	11.7	44.7
Gelora Djaja	Wismilak	12	36	6000	5167	19.7	43.1
Gudang Garam	International	12	40	5900	5288	12.1	44.8
Gudang Garam	Professional	16	40	7700	6600	17.9	47.2
Gudang Garam	Surya	16	40	7700	6663	16.0	46.4
Lestari Putera	Star Mild	16	40	6500	5775	13.0	45.2
Nojorono	Minak Djinggo Filter	12	36	3500	3625	-3.3	34.8
NTI	Clas Mild	16	26	5500	4617	19.6	31.1
Sampoerna	A - International	12	40	5900	4850	21.9	48.8
Sampoerna	A - Mild	16	40	7700	6608	16.9	46.7
Sampoerna	Dji Sam Soe Filter	12	40	5900	5408	9.2	43.7
Stevania	Brown	12	36	5000	3700	35.6	48.8
Wikatama Indah	Mustang	12	36	5000	4194	20.6	43.4
Machine-Rolled White Cigarettes (SPM)							
BAT[1]	Ardath Filter	20	40	6400	5770	11.1	44.4
BAT[1]	Lucky Strike	20	40	7800	6650	17.8	47.1
BAT[1]	Pall Mall Filter	20	40	6500	5583	16.5	46.6
Philip Morris	Long Beach Filter	20	40	6400	5313	20.7	48.3
Philip Morris	Marlboro Filter	20	40	7800	6913	13.2	45.3
RPMI[2]	Dunhill Menthol	20	36	8200	7767	5.7	38.0
Sampoerna[2]	S.J. Dupont	20	36	8200	6350	29.3	46.6
Rothmans	Kansas Lights Filter	20	40	5100	4100	24.5	49.8

[1] British American Tobacco [2] Under license

Table 5. Overall Cigarette Excise Tax Rates in Indonesia, 2003	
SKT	
Unadjusted	19.4
Adjusted	21.8
SKM	
Unadjusted	38.6
Adjusted	45.5
SPM	
Unadjusted	38.6
Adjusted	44.7
Total	
Unadjusted	31.5
Adjusted	36.6

Table 6. Cigarette Excise Tax Rates and Consumer Cost of Marlboro Cigarette Brand in Selected Countries, 2000

	Overall Excise Tax Rate (% of consumer price)	Minutes of Labor to Earn One Pack[1]
Singapore	73	43
Thailand	70	35
Philippines	63	42
China	40	62
Vietnam	36	n/a
Malaysia	33	21
Indonesia	30	62
Cambodia	20	n/a

[1] Local price divided by weighted net hourly wage in 12 occupations. Marlboro or nearest equivalent international brand. n/a = not available

Table 7. Demand Price Elasticity Calculations Based on Changes between Given Year and 2002

	Percentage Change*				Implied Price Elasticity		
Year	Quantity	Population	Real Income per Capita	Real Price	If $e_I = 0.4$	If $e_I = 0.6$	If $e_I = 0.8$
1998	-11.06	5.68	6.49	32.66	-0.59	-0.63	-0.67
1999	-13.33	4.28	7.08	26.64	-0.77	-0.82	-0.87
2000	-2.23	2.88	4.05	20.05	-0.83	-0.87	-0.92
2001	-11.81	1.45	2.11	9.53	-1.48	-1.52	-1.57

*Calculated as a percentage of the 2002 value

Table 8. Parameterizations for Calculation of Own-Price Elasticities

	SKT	SKM	SPM
Income elasticity of demand	0.27	0.77	1.16
Rival product type 1	SKM	SKT	SKM
Rival product type 2	SPM	SPM	SKT
Sum of cross-price elasticities	0.40	0.40	0.40
Rival 1 cross-price elasticity	0.23	0.19	0.23
Rival 2 cross-price elasticity	0.17	0.21	0.17

Table 9. Calculation of Own-price Elasticities of Demand Based on Changes from 1999 to 2002 and 2001 to 2002

	Based on Changes from 1999 to 2002			Based on Changes from 2001 to 2002		
	SKT	SKM	SPM	SKT	SKM	SPM
Quantity increase (%)	-6.77	-14.62	-30.52	-11.52	-14.11	-2.70
Own price increase (%)	28.31	25.57	25.40	11.14	8.58	8.05
Own-price elasticity of demand	-0.82	-1.37	-2.11	-1.52	-2.45	-1.30

* Calculated as a percentage of the 2002 value

Table 10. Benchmark 2002 Values Used in Revenue Maximization Exercises

	SKT	SKM	SPM	Total
Quantity (million cigarettes)	78,065	98,670	22,397	176,735
Real price (1996 = 100)	143.46	159.93	189.01	
Official excise tax rate (%)	20.0	40.0	40.0	
Effective excise tax rate (%)	20.2	43.1	40.8	
Tax revenue (Rp trillion)	4.50	14.20	2.56	18.70
Supply price (real price units)	114.91	90.99	113.24	

Table 11. Calculation of Effective Excise Tax Rates that Maximize Revenues, Various Scenarios

	Own-price Elasticities Calculated Based on 1999-2002				Own-price Elasticities Calculated Based on 2001-2002			
1	SKT	SKM	SPM	Total	SKT	SKM	SPM	Total
Demand Elasticities								
Income	0.27	0.77	1.16		0.27	0.77	1.16	
Sum of cross-price	0.40	0.40	0.40		0.40	0.40	0.40	
Rival 1 cross-price	0.23	0.19	0.23		0.23	0.19	0.23	
Rival 2 cross-price	0.17	0.21	0.17		0.17	0.21	0.17	
Own-price	-0.82	-1.37	-2.11		-1.52	-2.45	-1.30	
To maximize revenues								
Effective excise tax rate	54.2	56.2	54.7	55.3	39.6	45.7	58.7	45.2
Percentage changes								
Quantity	-48.6	-19.6	-45.1	-32.4	-40.0	3.4	-49.5	-15.8
Real price	74.1	29.8	30.5	45.7	32.1	4.7	43.1	18.8
Real expenditure	-10.5	4.3	-28.4	-5.4	-20.8	8.3	-27.7	-7.0
Real tax revenue	140.0	35.9	-4.2	80.1	55.2	14.7	3.8	44.6
2	SKT	SKM	SPM	Total	SKT	SKM	SPM	Total
Demand Elasticities								
Income	0.27	0.77	1.16		0.27	0.77	1.16	
Sum of cross-price	0.40	0.40	0.20		0.40	0.40	0.20	
Rival 1 cross-price	0.33	0.29	0.13		0.33	0.29	0.13	
Rival 2 cross-price	0.07	0.11	0.07		0.07	0.11	0.07	
Own-price	-0.82	-1.38	-1.90		-1.52	-2.48	-1.05	
To maximize revenues								
Effective excise tax rate	51.9	55.8	55.6	54.4	37.7	46.1	62.6	45.0
Percentage changes								
Quantity	-42.2	-23.1	-54.8	-31.5	-36.5	6.2	-58.5	-12.7
Real price	65.9	28.8	33.2	42.8	28.0	5.6	58.0	19.1
Real expenditure	-4.0	-0.9	-39.8	-7.3	-18.7	12.1	-34.4	-5.3
Real tax revenue	146.8	28.3	-18.1	73.5	51.6	19.9	0.5	47.0
3	SKT	SKM	SPM	Total	SKT	SKM	SPM	Total
Demand Elasticities								
Income	0.10	0.65	0.74		0.10	0.65	0.74	
Sum of cross-price	0.40	0.40	0.40		0.40	0.40	0.40	
Rival 1 cross-price	0.23	0.19	0.23		0.2	0.2	0.2	
Rival 2 cross-price	0.17	0.21	0.17		0.17	0.21	0.17	
Own-price	-0.78	-1.34	-2.00		-1.48	-2.42	-1.19	
To maximize revenues								
Effective excise tax rate	55.7	57.0	56.2	56.5	40.3	46.1	60.5	45.8
Percentage changes								
Quantity	-48.9	-19.9	-49.0	-32.7	-40.0	3.3	-52.2	-15.9
Real price	80.3	32.3	35.0	49.7	33.7	5.5	49.7	20.4
Real expenditure	-7.8	6.0	-31.2	-4.0	-19.8	8.9	-28.4	-6.4
Real tax revenue	154.4	40.2	-5.3	86.8	60.0	16.4	6.1	47.5
4	SKT	SKM	SPM	Total	SKT	SKM	SPM	Total
Demand Elasticities								
Income	0.27	0.77	1.16		0.27	0.77	1.16	
Sum of cross-price	0.00	0.00	0.00		0.00	0.00	0.00	
Rival 1 cross-price	0.00	0.00	0.00		0.00	0.00	0.00	
Rival 2 cross-price	0.00	0.00	0.00		0.00	0.00	0.00	
Own-price	-0.46	-0.95	-1.69		-1.22	-2.00	-0.82	
To maximize revenues								
Effective excise tax rate	59.9	56.6	45.8	56.5	39.1	45.0	57.9	44.9
Percentage changes								
Quantity	-45.4	-29.5	-15.4	-36.5	-37.7	-6.8	-33.3	-20.5
Real price	99.1	30.9	9.1	51.2	31.0	3.4	40.6	17.5
Real expenditure	8.7	-7.6	-7.7	-1.8	-18.4	-3.6	-6.2	-9.3
Real tax revenue	222.6	21.2	3.4	91.1	58.0	0.5	33.1	40.3
5	SKT	SKM	SPM	Total	SKT	SKM	SPM	Total
Demand Elasticities								
Income	0.60	0.60	0.60		0.60	0.60	0.60	
Sum of cross-price	0.40	0.40	0.40		0.40	0.40	0.40	
Rival 1 cross-price	0.22	0.22	0.21		0.22	0.22	0.21	
Rival 2 cross-price	0.18	0.18	0.19		0.18	0.18	0.19	
Own-price	-0.90	-1.33	-1.96		-1.58	-2.41	-1.16	
To maximize revenues								
Effective excise tax rate	52.0	56.4	56.2	54.9	39.1	46.1	61.3	45.5
Percentage changes								
Quantity	-46.7	-20.5	-50.0	-32.1	-38.5	3.9	-54.2	-14.9
Real price	66.3	30.4	35.2	44.0	31.1	5.5	52.8	19.7
Real expenditure	-11.4	3.6	-32.4	-6.6	-19.4	9.6	-29.9	-6.2
Real tax revenue	128.2	35.5	-6.9	76.4	56.0	17.1	5.2	46.8

Table 12. Employment in Medium and Large Establishments in the Cigarette Sectors, 2000

	Kretek Cigarettes	White Cigarettes	Total
Establishments	210	10	220
Production Workers	185,086	2,976	188,062
Male	18,247	1,998	20,245
Female	166,839	978	167,817
All Workers	200,900	4,353	205,253

Table 13. Production and Productivity in Medium and Large Establishments in the Cigarette Sector, 2000

	SKT	SKM	SPM
Output (number of cigarettes)	77,880,135,664	116,597,217,049	46,718,191,974
Number of production workers	177,659	7,427	2,976
Output per production worker	438,370	15,698,317	15,698,317

Table 14. Monthly Compensation per Worker in Medium and Large Establishments in the Cigarette Sectors and All Manufacturing, 2000 (Rp thousands)

	Kretek Cigarettes	White Cigarettes	All Manufacturing
Production Workers	350.9	885.1	557.9
All Workers	492.6	960.4	695.9

Table 15. Household Expenditures by Percentiles of Total Monthly Household Expenditure per Person, 2002

Expenditure per Person		Share of Cigarettes in Total Expenditure (%)			Share of Food and Beverages in Total Expenditure (%)		
Percentile	Minimum	Median	Mean	Maximum	Median	Mean	Maximum
0-10	28,390	4.2	5.9	41.6	65.4	65.2	95.9
10-20	94,613	7.1	8.0	42.0	62.3	62.1	96.3
20-30	112,707	8.5	9.4	42.7	60.4	60.6	94.5
30-40	128,985	9.4	9.9	41.2	59.1	59.2	93.3
40-50	146,037	9.6	10.4	54.8	58.1	58.0	88.8
50-60	164,812	10.5	11.3	54.5	56.8	56.6	90.7
60-70	188,525	10.6	11.3	51.7	55.4	55.3	86.7
70-80	220,069	10.6	11.3	54.9	52.8	52.9	88.2
80-90	269,833	9.8	10.7	54.9	50.1	50.2	90.6
90-100	366,377	7.5	9.1	58.4	42.2	42.3	90.6
Total		8.9	9.7		57.0	56.2	

Table 16. Share in Total Cigarette Expenditure by Percentiles of Total Household Expenditure per Person and Type of Cigarette, 2002 (%)

Percentile	SKT	SKM	SPM	Total
0-10	5.2	2.3	3.0	3.3
10-20	7.3	4.2	3.9	5.2
20-30	9.4	5.5	5.0	6.8
30-40	9.7	6.7	6.9	7.7
40-50	10.6	7.9	6.6	8.7
50-60	11.3	9.7	8.6	10.2
60-70	11.9	11.3	8.7	11.3
70-80	11.2	14.4	13.1	13.2
80-90	11.6	17.4	13.9	15.3
90-100	11.7	20.7	30.5	18.3
Total	100.0	100.0	100.0	100.0

Table 17. Cigarette Prices, Quantities, and Expenditure Shares by Percentiles of Total Household Expenditure per Person and Type of Cigarette, 2002

	Mean Price (Rp per cigarette)			Mean Quantity Consumed (cigarettes per week)			Mean Expenditure Share (%)		
Percentile	SKT	SKM	SPM	SKT	SKM	SPM	SKT	SKM	SPM
0-10	245	288	204	14	10	2	3.1	2.5	0.3
10-20	261	297	234	18	17	2	3.9	3.8	0.3
20-30	269	308	224	22	21	3	4.6	4.5	0.4
30-40	273	312	229	22	26	4	4.4	5.1	0.5
40-50	281	319	241	24	29	3	4.5	5.5	0.4
50-60	282	327	248	25	35	4	4.4	6.4	0.5
60-70	295	335	265	25	39	4	4.2	6.6	0.5
70-80	307	346	290	23	48	5	3.4	7.3	0.6
80-90	331	359	294	21	56	5	2.8	7.4	0.5
90-100	371	370	359	20	63	9	1.9	6.4	0.8
Total	287	333	273	11	18	2	3.7	5.5	0.5

Table 18. Expenditure Elasticities of Demand Based on 2002 Susenas Data

	SKT	SKM	SPM	Total
Based on Actual Quantities Purchased	0.10	0.65	0.74	0.46
Based on Quality-Adjusted Quantities	0.27	0.77	1.16	0.63

Table 19. Impact of An Increase in Cigarette Excise Rates on Cigarette Expenditure Shares Across the Income-Expenditure Distribution (Based on Table 11, Scenario 4)

	Expenditure Share: Initial				Expenditure Share: New			
Percentile	SKT	SKM	SPM	Total	SKT	SKM	SPM	Total
0-10	3.1	2.5	0.3	5.9	3.4	2.3	0.3	5.9
10-20	3.9	3.8	0.3	8.0	4.2	3.5	0.3	8.0
20-30	4.6	4.5	0.4	9.4	5.0	4.1	0.3	9.4
30-40	4.4	5.1	0.5	9.9	4.7	4.7	0.5	9.9
40-50	4.5	5.5	0.4	10.4	4.9	5.1	0.4	10.3
50-60	4.4	6.4	0.5	11.3	4.8	5.9	0.5	11.1
60-70	4.2	6.6	0.5	11.3	4.6	6.1	0.5	11.2
70-80	3.4	7.3	0.6	11.3	3.7	6.7	0.6	11.0
80-90	2.8	7.4	0.5	10.7	3.1	6.8	0.5	10.4
90-100	1.9	6.4	0.8	9.1	2.1	5.9	0.7	8.8
Total	3.7	5.5	0.5	9.7	4.0	5.1	0.4	9.6

Table 20. Weighted Average Official Retail Prices and Implied Supply Prices for Large, Medium, and Small Firms by Product, 2002 (Rupiah per Cigarette)[1]

	SKT		SKM		SPM	
Size	Official	Supply	Official	Supply	Official	Supply
Large	373	299	409	245	288	173
Medium	274	240	318	203	172	120
Small[2]	241	222	281	208	164	121
Total	344	282	385	235	265	163

[1] Weighted averages computed using production weights for all brands from the first half of 2002.
[2] Includes both small and tiny companies in the case of SKT.

Table 21. Aggregate Market Shares of Large, Medium, and Small Firms by Product and in Total, First Half of 2002 (percent)[1]

Size	SKT	SKM	SPM	Total
Large	75.6	75.2	81.0	76.1
Medium	9.6	20.9	10.9	15.4
Small[2]	14.8	3.8	8.1	8.5
Total	37.1	49.9	12.9	100.0

[1] Quantities of cigarettes unweighted by value.
[2] Includes both small and tiny companies in the case of SKT.

Table 22. Numbers of Distinct Companies Producing Each Cigarette Type and in Total, 2002

Size	SKT	SKM	SPM	Total
Large	4	4	3	8
Medium	10	20	3	12
Small[1]	155	52	13	172
Total	169	76	19	192

[1] Includes both small and tiny companies in the case of SKT.

Table 23. Calculation of Single Percentage Tax Rate that Maximize Revenues, Various Scenarios

	Own-price Elasticities Calculated Based on 1999-2002				Own-price Elasticities Calculated Based on 2001-2002				
1		SKT	SKM	SPM	Total		SKT	SKM	SPM	Total
	Demand Elasticities					Demand Elasticities				
	Income	0.27	0.77	1.16		Income	0.27	0.77	1.16	
	Sum of cross-price	0.40	0.40	0.40		Sum of cross-price	0.40	0.40	0.40	
	Rival 1 cross-price	0.23	0.19	0.23		Rival 1 cross-price	0.23	0.19	0.23	
	Rival 2 cross-price	0.17	0.21	0.17		Rival 2 cross-price	0.17	0.21	0.17	
	Own-price	-0.82	-1.37	-2.11		Own-price	-1.52	-2.45	-1.30	
	To maximize revenues					To maximize revenues				
	Percentage excise tax rate	55.2	55.2	55.2		Percentage excise tax rate	43.7	43.7	43.7	
	Percentage changes					Percentage changes				
	Quantity	-52.3	-14.7	-48.4	-31.3	Quantity	-62.1	7.1	0.6	-23.5
	Real price	78.1	27.0	32.1	45.6	Real price	41.7	1.0	5.1	15.9
	Real expenditure	-15.0	8.4	-31.9	-5.5	Real expenditure	-46.3	8.2	5.7	-11.7
	Real tax revenue	132.5	38.8	-7.9	79.7	Real tax revenue	16.1	9.7	13.1	32.8
2		SKT	SKM	SPM	Total		SKT	SKM	SPM	Total
	Demand Elasticities					Demand Elasticities				
	Income	0.27	0.77	1.16		Income	0.27	0.77	1.16	
	Sum of cross-price	0.40	0.40	0.20		Sum of cross-price	0.40	0.40	0.20	
	Rival 1 cross-price	0.33	0.29	0.13		Rival 1 cross-price	0.33	0.29	0.13	
	Rival 2 cross-price	0.07	0.11	0.07		Rival 2 cross-price	0.07	0.11	0.07	
	Own-price	-0.82	-1.38	-1.90		Own-price	-1.52	-2.48	-1.05	
	To maximize revenues					To maximize revenues				
	Percentage excise tax rate	54.3	54.3	54.3		Percentage excise tax rate	43.1	43.1	43.1	
	Percentage changes					Percentage changes				
	Quantity	-51.0	-17.3	-47.9	-32.2	Quantity	-60.9	5.6	-1.5	-23.8
	Real price	74.7	24.5	29.5	42.8	Real price	40.2	0.0	4.0	14.6
	Real expenditure	-14.4	3.0	-32.5	-8.1	Real expenditure	-45.1	5.5	2.4	-13.1
	Real tax revenue	130.3	29.8	-10.2	72.0	Real tax revenue	17.1	5.5	8.1	29.0
3		SKT	SKM	SPM	Total		SKT	SKM	SPM	Total
	Demand Elasticities					Demand Elasticities				
	Income	0.10	0.65	0.74		Income	0.10	0.65	0.74	
	Sum of cross-price	0.40	0.40	0.40		Sum of cross-price	0.40	0.40	0.40	
	Rival 1 cross-price	0.23	0.19	0.23		Rival 1 cross-price	0.2	0.2	0.2	
	Rival 2 cross-price	0.17	0.21	0.17		Rival 2 cross-price	0.17	0.21	0.17	
	Own-price	-0.78	-1.34	-2.00		Own-price	-1.48	-2.42	-1.19	
	To maximize revenues					To maximize revenues				
	Percentage excise tax rate	56.4	56.4	56.4		Percentage excise tax rate	44.1	44.1	44.1	
	Percentage changes					Percentage changes				
	Quantity	-51.4	-16.8	-50.4	-32.1	Quantity	-62.2	5.5	0.5	-24.4
	Real price	83.2	30.6	35.8	49.7	Real price	42.9	1.9	5.9	16.8
	Real expenditure	-11.0	8.7	-32.7	-4.0	Real expenditure	-45.9	7.5	6.5	-11.8
	Real tax revenue	148.9	42.2	-7.0	86.6	Real tax revenue	18.2	10.1	15.2	34.1
4		SKT	SKM	SPM	Total		SKT	SKM	SPM	Total
	Demand Elasticities					Demand Elasticities				
	Income	0.27	0.77	1.16		Income	0.27	0.77	1.16	
	Sum of cross-price	0.00	0.00	0.00		Sum of cross-price	0.00	0.00	0.00	
	Rival 1 cross-price	0.00	0.00	0.00		Rival 1 cross-price	0.00	0.00	0.00	
	Rival 2 cross-price	0.00	0.00	0.00		Rival 2 cross-price	0.00	0.00	0.00	
	Own-price	-0.46	-0.95	-1.69		Own-price	-1.22	-2.00	-0.82	
	To maximize revenues					To maximize revenues				
	Percentage excise tax rate	55.6	55.6	55.6		Percentage excise tax rate	43.7	43.7	43.7	
	Percentage changes					Percentage changes				
	Quantity	-36.6	-26.8	-56.4	-31.1	Quantity	-50.7	-2.0	-4.1	-23.5
	Real price	79.8	28.2	33.3	47.0	Real price	41.7	1.0	5.1	15.9
	Real expenditure	14.1	-6.2	-41.9	-3.8	Real expenditure	-30.1	-1.0	0.7	-11.2
	Real tax revenue	214.2	21.0	-20.8	84.3	Real tax revenue	51.1	0.3	7.7	33.5
5		SKT	SKM	SPM	Total		SKT	SKM	SPM	Total
	Demand Elasticities					Demand Elasticities				
	Income	0.60	0.60	0.60		Income	0.60	0.60	0.60	
	Sum of cross-price	0.40	0.40	0.40		Sum of cross-price	0.40	0.40	0.40	
	Rival 1 cross-price	0.22	0.22	0.21		Rival 1 cross-price	0.22	0.22	0.21	
	Rival 2 cross-price	0.18	0.18	0.19		Rival 2 cross-price	0.18	0.18	0.19	
	Own-price	-0.90	-1.33	-1.96		Own-price	-1.58	-2.41	-1.16	
	To maximize revenues					To maximize revenues				
	Percentage excise tax rate	54.6	54.6	54.6		Percentage excise tax rate	43.4	43.4	43.4	
	Percentage changes					Percentage changes				
	Quantity	-57.3	-13.1	-39.9	-32.7	Quantity	-63.9	7.2	2.6	-24.2
	Real price	75.9	25.4	30.4	43.8	Real price	41.1	0.6	4.6	15.3
	Real expenditure	-25.0	8.9	-21.6	-7.4	Real expenditure	-49.1	7.8	7.3	-12.7
	Real tax revenue	103.0	38.1	4.9	74.3	Real tax revenue	9.6	8.6	14.2	30.6

Table 24. Calculation of Specific Excise Tax per Unit that Maximizes Revenues, Various Scenarios

	Own-price Elasticities Calculated Based on 1999-2002				Own-price Elasticities Calculated Based on 2001-2002			
1	SKT	SKM	SPM	Total	SKT	SKM	SPM	Total
Demand Elasticities								
Income	0.27	0.77	1.16		0.27	0.77	1.16	
Sum of cross-price	0.40	0.40	0.40		0.40	0.40	0.40	
Rival 1 cross-price	0.23	0.19	0.23		0.23	0.19	0.23	
Rival 2 cross-price	0.17	0.21	0.17		0.17	0.21	0.17	
Own-price	-0.82	-1.37	-2.11		-1.52	-2.45	-1.30	
Specific Tax (Rp/cigarette)	247	247	247		160	160	160	
Percentage tax rate equivalent	51.8	56.5	60.4	54.8	41.1	45.8	49.7	44.9
Percentage changes								
Quantity	-38.3	-19.4	-86.4	-27.7	-49.7	-1.3	-16.0	-22.7
Real price	65.7	30.9	49.5	45.7	35.5	4.9	17.7	17.5
Real expenditure	2.3	5.6	-79.7	-4.1	-31.9	3.5	-1.1	-9.9
Real tax revenue	162.6	38.5	-70.0	72.5	38.7	9.9	20.5	33.0
2	SKT	SKM	SPM	Total	SKT	SKM	SPM	Total
Demand Elasticities								
Income	0.27	0.77	1.16		0.27	0.77	1.16	
Sum of cross-price	0.40	0.40	0.20		0.40	0.40	0.20	
Rival 1 cross-price	0.33	0.29	0.13		0.33	0.29	0.13	
Rival 2 cross-price	0.07	0.11	0.07		0.07	0.11	0.07	
Own-price	-0.82	-1.38	-1.90		-1.52	-2.48	-1.05	
Specific Tax (Rp/cigarette)	243	243	243		158	158	158	
Percentage tax rate equivalent	51.4	56.1	60.0	54.4	40.7	45.4	49.4	44.6
Percentage changes								
Quantity	-39.5	-20.3	-83.1	-28.8	-50.2	-1.9	-14.9	-23.2
Real price	64.3	29.7	48.0	44.5	34.7	4.2	16.9	16.7
Real expenditure	-0.7	3.4	-75.0	-5.9	-32.9	2.3	-0.6	-10.9
Real tax revenue	153.1	34.7	-63.2	68.3	35.3	7.7	20.3	30.4
3	SKT	SKM	SPM	Total	SKT	SKM	SPM	Total
Demand Elasticities								
Income	0.10	0.65	0.74		0.10	0.65	0.74	
Sum of cross-price	0.40	0.40	0.40		0.40	0.40	0.40	
Rival 1 cross-price	0.23	0.19	0.23		0.2	0.2	0.2	
Rival 2 cross-price	0.17	0.21	0.17		0.17	0.21	0.17	
Own-price	-0.78	-1.34	-2.00		-1.48	-2.42	-1.19	
Specific Tax (Rp/cigarette)	259	259	259		163	163	163	
Percentage tax rate equivalent	53.0	57.7	61.6	55.9	41.6	46.2	50.2	45.4
Percentage changes								
Quantity	-37.2	-21.5	-88.0	-28.4	-49.7	-2.9	-14.9	-23.6
Real price	70.0	34.6	54.0	49.7	36.6	5.8	18.8	18.5
Real expenditure	6.8	5.7	-81.6	-2.6	-31.3	2.7	1.1	-9.9
Real tax revenue	180.7	41.6	-72.2	79.0	41.4	10.2	24.3	34.3
4	SKT	SKM	SPM	Total	SKT	SKM	SPM	Total
Demand Elasticities								
Income	0.27	0.77	1.16		0.27	0.77	1.16	
Sum of cross-price	0.00	0.00	0.00		0.00	0.00	0.00	
Rival 1 cross-price	0.00	0.00	0.00		0.00	0.00	0.00	
Rival 2 cross-price	0.00	0.00	0.00		0.00	0.00	0.00	
Own-price	-0.46	-0.95	-1.69		-1.22	-2.00	-0.82	
Specific Tax (Rp/cigarette)	240	240	240		157	157	157	
Percentage tax rate equivalent	51.2	55.9	59.8	53.9	40.6	45.3	49.3	44.3
Percentage changes								
Quantity	-29.1	-27.7	-79.9	-28.3	-41.9	-8.0	-13.6	-23.0
Real price	63.6	29.1	47.2	43.7	34.5	4.0	16.6	16.5
Real expenditure	15.9	-6.7	-70.5	-4.8	-21.9	-4.3	0.7	-10.2
Real tax revenue	194.1	21.1	-56.8	68.7	57.3	0.5	21.6	30.5
5	SKT	SKM	SPM	Total	SKT	SKM	SPM	Total
Demand Elasticities								
Income	0.60	0.60	0.60		0.60	0.60	0.60	
Sum of cross-price	0.40	0.40	0.40		0.40	0.40	0.40	
Rival 1 cross-price	0.22	0.22	0.21		0.22	0.22	0.21	
Rival 2 cross-price	0.18	0.18	0.19		0.18	0.18	0.19	
Own-price	-0.90	-1.33	-1.96		-1.58	-2.41	-1.16	
Specific Tax (Rp/cigarette)	246	246	246		160	160	160	
Percentage tax rate equivalent	51.8	56.5	60.4	55.0	41.1	45.7	49.7	45.0
Percentage changes								
Quantity	-43.6	-18.2	-77.9	-29.4	-51.8	-1.4	-12.7	-23.7
Real price	65.7	30.9	49.4	45.7	35.5	4.9	17.7	17.4
Real expenditure	-6.6	7.0	-67.0	-5.3	-34.7	3.4	2.7	-10.6
Real tax revenue	139.8	40.3	-51.2	70.9	32.8	9.7	25.0	32.0